

SENILE CATARACT IN INDIA.

Thesis for the degree of M. D.

by

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1.

This thesis will deal with the subject of senile cataract as met with in India because my experience of the disease has been gained in the East and because, though the disease is essentially the same in all countries, yet the conditions under which we treat cataract in India differ in several important respects from the conditions that prevail in Europe. I shall endeavour to confine myself mainly to those points regarding which my personal experience has enabled me to form an opinion.

The operation, of extraction I have performed from 100 to 150 times beginning in 1896. Owing to the exigencies of government service my surgical work has, till recently, been greatly interrupted and I have several times had to begin again as it were.

On this account the difficulties of the operation of extraction have been the more firmly impressed on my mind. The operator who makes steady progress to a high degree of proficiency probably forgets some of the difficulties that beset him at his initial efforts.

I put my average successes at about 75%, a poor figure compared with most published records. We learn more however from our failures than from our successes./

successes.

My record of comparatively poor results is perhaps as instructive as the brilliant records of accomplished operators who while differing in what are considered important measures of operative technique yet equally attain to a high percentage of successes. It is just this high degree of success obtained by experts that makes it so difficult to judge from statistics of the value of any particular measure. When we compare the figures given by different surgeons small differences in the percentage of successes may just as reasonably be attributed to the personal equation - both in operative dexterity and accuracy of recording - as to the difference in the measures adopted at the operation.

Table I.

Number of extractions operator and method.	% Results.		
	good	indifferent	bad.
1000. Maynard, usually combined operation with conjunctival flap. (1)	89	- 5.7 -	4.5
315. Pank 3 millimetre flap combined. (2)	92.1	- -	
1804. Smith./			

(Table cont.)

1804. Smith			
with capsulotomy in 1034	95.5	- 2.0	- 2.5
in the capsule in 770 (3)			
1650. Smith	96.05	- 2.3	- 1.05
with capsulotomy in 89			
in capsule in 1561 (4)			
936. Neve	82	--11.0	- 7.0
modified linear			
combined operation. (5)			
1523. Morwood. (6)	74.55	-	-
corueal incision			
Usually simple operation.			
1235. Pope. (6)	-	-	6.6
988. Pope. (8)	91.2	-	-
1124. Pope. (9)	91.4	-	-
Usually the simple method			
with preliminary laceration			
of the capsule and conjunctional			
ional flap.			
1626. Drake- Brockman (10)	-	-	-
simple method in 1165			
primary capsular laceration			
in 1433.			
118. Gimlette. (11)/			

(Table cont.)

118. Gimlette.	(11)	97.5	-	2.5
all extracted in the capsule.				

3400. Mulroney. (12) No particulars available but Mulroney must have had a great measure of success as his reputation is great among the natives throughout the Eastern Punjab. He makes a large incision in the lower segment of the cornea and extracts in the capsule without an iridectomy.

According to these statistics extraction in the capsule gives the best results but though Pope, Neve, Herbert and Maynard have not given detailed statistics of this method, their experience of it has been very unfavourable. I shall say something about this method later.

If from a study of the figures we try to compare the simple with the combined operation we will not get much satisfaction. The difference in % of successes may be due to other differences in technique besides the iridectomy and as I have already said the personal equation must be taken into account.

Statistics showing variety of method and result in the hands of the same operator when that operator is experienced are of much greater value than statistics/

statistics from different sources. I shall have occasion to refer again to the above table.

The statistics are interesting as showing the large number of extractions that are done in different parts of India.

- (1) Maynard India Medical Gazette, Feb. 1903.
- (2) Pank. I. M. G. June 1901.
- (3) (4) Smith. I. M. G. July 1900. June 1901.
- (5) Neve. I. M. G. June 1901.
- (6) Morwood. I. M. G. June 1901
- (7) Pope. I. M. G. Sept. 1903.
- (8) (9) Pope. I. M. G. June 1901.
- (10) Drake-Brockman. Oph. Rev. Nov. 1888.
- (11) Gimlette. Calcutta Medical Congress Trans.
I. M. G. June 1901.
- (12) Mulroney. Calcutta Medical Congress Trans.
I. M. G. June 1901.

Chapter I.

I have said that there are important differences between Indian and European conditions. The conditions differ then in respect of surgeon, hospital appliances and nursing - the physical condition and very nature of our patients.

A. The Surgeon.

Most of the junior surgeons in India are men who entering the Indian Medical Service immediately after qualifying, have had no special training in ophthalmic work. We have therefore to become proficient^{by}, seeing others operate when the opportunity occurs, by studying the literature of the subject, by practising on the eyes of freshly killed animals and by experience. Practising the extraction of the lens from the eye of a freshly killed animal is of great value to the beginner. It makes him familiar with the steps of the operation and with the consistence of the tissues that have to be dealt with. When I began to do extractions in the Kurram Valley in 1896 I practised on the eyes of freshly killed goats before doing my first case. In extraction, as in other operations, a written description is a poor substitute for practical demonstration./

demonstration. One learns the details carefully but when the time comes it is difficult to keep all the points in mind. By concentrating the mind on one detail other details are apt to be neglected, while the occurrence of an accident, such as prolapse of iris or vitreous, drives all the book learning out of the head of the embryo operator. The evolution of the skilled operator in Europe is of course quite different. He sees and assists at many eye operations as house and assistant surgeon before making a start on his own account and when he does so he is so familiar with the minor technical measures that his mind is free ^{to} deal with the important details. If one of the common accidents does occur, well! he has probably seen it occur before and will not be unduly alarmed and flurried. Moreover at his initial efforts his chief is generally present to come to the rescue if necessary. This imperfect training of the Indian Surgeon is, I admit, unfortunate and a good many eyes are no doubt lost in consequence. This is not the place to discuss possible ways of improving ophthalmic teaching for the young I. M. S. officer and in the meantime we must take things as we find them. The young surgeon in India is oftener than/

than not comparatively untrained in eye operations. He will require all his wits to carry him through a normal extraction and therefore, I maintain, he should elect for the operation that combines simplicity and ease of performance with safety and useful vision.

B. Hospitals.

In the three Presidency towns in India there are special ophthalmic hospitals. A few civil surgeons have a special room for their cataract operations, but the majority of surgeons have to operate in the general operating theatre which from want of funds is as a rule considerably behind the standard which now obtains in Europe. My first extractions were done in a mud building with a mud floor and in several stations I have operated on cases in my own house, the after treatment being carried out in a servants' quarter: a small mud hut. Latterly I have had good theatres of modern type but septic cases have of necessity to be treated almost daily in the same theatre. When visiting outlying dispensaries I have often operated in the open air.

C. Instruments.

In India one often has to operate with inferior instruments. The surgeon who is in a permanent appointment can keep his instruments in good order/

order but when, as often happens, several changes occur in quick succession the instruments, being left in the care of a native assistant are liable to be neglected. Quite recently I had to censure an assistant surgeon for allowing his instruments to get into a disgraceful condition and I had to operate with a knife sharpened by myself. It was only after I had done about 30 extractions that for the first time I used a perfect Von Graefe knife. It was a revelation to me. It matters less to the adept if his knife is not quite sharp but it is very disconcerting to the beginner and it tends to make the patient unsteady. A sharp knife makes a more even wound and we thereby obtain more rapid adhesion of the wound and consequently a diminished risk of infection.

D. Assistants.

In my experience good and trustworthy assistants and attendants have been the exception. In my first cases my assistant was a man who had been under Mulroney in a large district in the Punjab. He had assisted at hundreds of extractions and yet I found, that though he was thoroughly competent as an assistant, he was not to be trusted in the after treatment.

From/

From 1894 to 1903 from an insufficiency of skilled assistance in my surgical operations I got into the way of doing too much myself, so that latterly when I have generally had several capable assistants I have had to train myself to use them properly. Happily in eye work one assistant is enough. At my headquarters hospital I have generally had a sufficiently capable assistant but when operating at outlying dispensaries the hospital assistant is often useless from nervousness as the occasion is the annual inspection of his dispensary. In one appointment I recently held the assistant on these occasions was the agency surgeon's office messenger. He was also a shikari (anglicé - huntsman) and from the nature of his calling had a cool head and a steady hand. My predecessor had trained him to assist at extractions and it was during an extraction to be noted hereafter that this man quietly took the lid elevator from the hospital assistant who was almost fainting with nervousness. As regards after-treatment it must be borne in mind that in most Indian hospitals there are no nurses. The patient is supposed to be visited several times daily by the assistant surgeon or ward attendant but the native, of whatever rank, is prone to hand on his duty to someone subordinate to himself/

to himself and I ~~have~~ no doubt that often the order to visit the patient at a particular hour is passed on till it ends in one of the menial servants making the visit: or saying that he did so. This failure to carry out orders in person is so well recognised that in the military department there is a standing order to the effect that hospitals assistants must on no account leave the dressing of surgical cases to the ward orderlies.

As a rule sheets are not used on the beds and even in the hot weather the native loves ^{to} sleep with his blanket pulled over his head. This custom is noteworthy and in itself contraindicates the open treatment after extraction.

E. The Indian Patient.

The brings us to the consideration of the patient himself. Our patients are mostly illiterate. They do not differ from the European as regards self-control and obedience to orders during the operation though it sometimes happens that the patient's ~~dialect~~ dialect is one with which none of the hospital staff are conversant. The surgeon very often has to give his instructions through the native assistant and there is thus a difficulty in communicating our orders quickly/

quickly to the patient. It is during the critical time following operation that our patients give most trouble.- Often on visiting my case on the evening of the day of operation I have found him sitting eating or smoking with his friends, or I find that he has moved the bandage because the eye was uncomfortable. This childlike behaviour also gives trouble before operation for in most cases where preliminary treatment of the conjunctiva is indicated we have to consider which will disappear first - the diseased state of the conjunctiva or the patient himself - we are often disappointed but seldom surprised to learn that there will be no operation as the patient has absconded. If the eye goes wrong after operation the patient often gets tired of treatment and runs away, losing the small amount of vision we might have saved for him. The patients are often dirty in the ordinary sense and always surgically dirty.

The condition of the conjunctival sac I shall take up later under the head of operability. I have dealt at some length with the conditions peculiar to the East because, apart from their general interest, they have a distinct bearing on preliminary treatment/

treatment, on the choice of operation and on after treatment.

CHAPTER II.

Etiology.

The essential cause of senile cataract is unknown but we know a good deal about the etiology of the disease.

Walther¹ has pronounced "that everyone becomes cataractous who does not die prematurely". This is overstating the case but we know that senility is a very marked factor in the causation. There is no doubt that cataract appears at an earlier age in India than in Europe and America.

Jackson² found that out of 1545 patients at the Philadelphia eye hospital over 50 years of age 449 had some degree of lens opacity.

Of these 449 cases.

15%	"	"	50 and 55 years.
16.1%	"	"	55 and 60 years.
30.2%	"	"	60 and 65 years.
77.7%	"	"	65 and 70 years.

Arlt³ quotes 882 cataract patients between 26 and 82 years, of these 626 were between 45 and 70 years.

From Indian records I take the following figures.
Drake-Brockman⁴ in Madras - 1626 extractions.

Most of these between 50 and 60 years. next in frequency between 40 and 50 years. Among the natives most cases occurred between 40 and 60 years.

Among the Europeans and Eurasians between 50 and 70 years.

Neve⁵ 1000 cases, average age 50 years.

Maynard⁶ 212 cases average age 51.7 years.

602 " " " 53 years.

Males 54.5. Females 51.0.

Hirschberg⁷ also notes that cataract comes on earlier in the tropics but he puts the majority at 40 years which is too early.

In my last series of 53 cases the average age comes to 53.4. It should be noted that cataracts come under notice at a much earlier stage in the West than in India. The difference in age incidence is therefore greater than is apparent from the figures. There is a considerable degree of error in the age-ing of native patients - the error however/

however is generally in the direction of overstating the age.

There is a pretty general consensus of opinion that the native of India ages sooner than the European; Maconachie of Bombay putting the difference at 10 years in the male and 20 years in the female. Enlargement of the prostate is rare in natives of India according to Senn⁸ but according to Freyer⁽⁵⁾ the condition occurs 10 years earlier in natives than in Europeans.

I have observed that premature loss of sexual power is very common in all parts of the country. This symptom and the average early senility of the native is I think partly due to the premature exercising of the sexual function. It is unquestionably the case in the female. The question of premature senility can be accurately studied in the native army. The recruit is enlisted at from 16 to 20 years as a rule. At this time there cannot be an error of more than 2 or 3 years regarding his age.

Twenty one years later the question of his age again arises when he goes on pension. By his papers I know him to be 37 or at most 40 but as often as not he looks 50. If a recruit is taken/

taken at 25 or over he tends to become an encumbrance to the service from age before he can go on pension.

I have I think shown conclusively that senility and "par*xi* passu" senile cataract occur early in India.

Next to senility the most marked factor and indeed, the only other certain factor, is, in my opinion, glare combined with heat. No one who has experienced the heat of the Punjab and who has seen how very prevalent cataract is in that province can fail to connect the two and enquire into the relationship.

Looking into the comparative prevalence of cataract in different parts of the East we find, I think, that the prevalence is greater where the air is clear, dry and hot and the light very bright.

In 1850 Grant marched with ^{Lord} Dalhousie across the hills from Simla to Mussoorie. He remarks "In these Himalayan wanderings I was much struck by the number of people who applied to me on account of blindness from cataract and operated on many of them". Neve notes that in Kashmir cataract is both relatively and actually far more common among the Mahomedans who work in the open than among the Hindus who are mostly dwellers in towns. In the high altitudes /

high altitudes of Ladakh and Baltistan the disease is relatively common and is due in Neve's opinion to the presence of large desert tracts from which there is a powerful glare. I have spent many months in Kashmir and though I used to see and treat a good many cases among the people I saw little cataract in the valley. The main valley is very wellwatered and for the most part as green as England. Ascending into this Kashmir valley from the heat and glare of the plains of Northern India or descending into it from the barrenness of higher altitudes one is at once conscious of the sense of rest to the eyes. The state of Kotah in Southern Rajputana has an average annual rainfall of over 30 inches, sufficient to keep the country green except for a few monthssin the year. I saw comparatively little cataract there whereas, in Bikanir, in Northern Rajputana, a desert country with an annual rainfall of only 11.29 inches, I did 13 extractions in the month of July 1904. I saw at least an equal number of inoperable cases and this was at the most unfavourable time of the year for hospital attendance. Then throughout the plains of the Punjab cataract is universally prevalent though the number of extractions done/

done in the different stations varies of course according to population, means of communication and reputation of the local surgeon.

Regarding countries East of India I have no statistics to offer but during the China Expedition of 1900-01 I was fortunately able to visit many places in the far East and met surgeons who were practising there. From what I heard and saw I believe this connection between glare and cataract to be pretty constant, shown as follows in the places where I made enquiry.

Singapore. Climate hot and moist, luxuriant vegetation. Cataract rare.

Hong - Kong. an island, damp, inhabitants mostly town dwellers. Cataract not common.

Shanghai. Hot and dusty in Summer. Cataract fairly common.

Wei-hei-wei. Maritime district. Climate not unlike that of N. Britain. We had a base hospital here with several experienced surgeons from India who were on excellent terms with the Chinese.

Few cataracts were treated.

North China./

North China - Tientsin. The climate except in the very severe Winter is not unlike that of N. W. India. On the march to the relief of Pekin our Sepoys fell out in large numbers suffering from heat exhaustion. Cataract was found by our surgeons from India to be common.

The following figures are taken from recent annual reports of the different provinces of India.

Province	Population	Total operations in 1 year.	Extractions in 1 year.
Punjab	21,000,000	162,396	5881
Bengal	77,000,000	184,420	2772
Bengal		171,647	3203
United Provinces	67,000,000	185,087	5172
Bombay	19,000,000	85,558	944
Madras	36,000,000	157,737	1420
Burma	8,000,000	not given	16

The Jullundur records are worthy of note
Jullundur Punjab.

One year (1899-1900) 1804 extractions.

One year (1900-1901) 1605 extractions.

The population of Jullundur district is about
900,000/

900,000 and during this time Mulroney was doing large numbers of extractions in the next district.

I shall now give a table showing from the above the percentage of extractions to total surgical operations as affording an index of the comparative prevalence of cataract.

Province.	Cataract Index.	Climate.
Punjab.	3.62	Dry and clear - most of it in N. W. dry area. Rainfall as low as 7.3 inches in places.
United Provinces.	2.79	Rainfall below 30 inches where the U.P. and Punjab meet but much higher in other parts.
Bengal.	1.5 and 1.86.	For the most part damp.
Bombay.	1.11	For the most part heavy rainfall but dry and sandy in places - part being in the N. W. dry area.
Madras.	.9	⁴⁷⁷ much of it tropical - some barren tracts.
Burma.	Only 16 extractions.	Rainfall high - tropical vegetation.
It/		

It should be noted that in the Punjab there are fewer surgeons than in the other provinces and in large tracts of country means of communication are bad, so that a large number of cases are untreated. The index figure is therefore too low. Compare the above figures with the prevalence in America. At the Will's Hospital Philadelphia the percentage of extractions to all cases of eye disease from 1872 to 1891 was only 1.1% and from 1886 to 1891 only .9%.

Since making this enquiry into the geographical distribution of cataract I have carefully studied the literature on the etiology of the disease. Several authors refer to the effect of strong light and heat on the lens. Beer, Walther, Mackenzie Arlt and Hasner all consider radiant heat to be a predisposing cause.⁽⁹⁾ Norris⁽⁹⁾ considers it generally admitted that cataract is more frequent and develops earlier in those who are especially exposed to exhausting physical labour and to intense glare and heat. The first of these two conditions, hard labour, is equally present through the East.- the second is, as I have shown, variable. Hirschberg⁽⁹⁾ found that in one factory 5 glass-blowers out of 30 were affected with cataract. He argues that prolonged exposure to a high temperature/

temperature causes internal changes in the lens. He has found that in puddles, stokers, glass-blowers long continued exposure to great heat causes a disturbance of nutrition of the eye shown by capillary congestion of the nerve head, abnormally intense red reflex from the choroid, a woolly and granular appearance of the retina and in many cases opacities in the lens. Widmark⁽⁹⁾ thinks that other influences in concentrated light come into play and that the ultra violet rays cause a splitting of the lens fibres. In most parts of India and par excellence in the plains of the Punjab the cultivators and other open air workers are exposed for several months on end to a continuous hot dry wind and a dazzling light - a veritable furnace -. Those are the persons who suffer more than any other race from cataract. I would here note that I have not yet come across a case of senile cataract in a European in India; it is undoubtedly rare. The European avoids glare by staying indoors during the heat of the day and, when he has to go forth, he wears a hat shading the eyes and often tinted glasses. The native wears a turban or skull cap that gives no shade/

shade to the eyes. The town dwelling native comes between these two groups as regards exposure to glare and frequency of cataract. In connection with Hirschberg's opinion that long continued exposure to great heat causes a disturbance of nutrition in the eye with the fundus changes already noted I would remark that when serving with native troops in the Punjab I saw a considerable number of cases of hemeralopia. Such cases came to hospital complaining of inability to see at night when on night-guards. Owing to the possibility of malingering I used to examine them with great care and in no case did I find any change in the fundus except sometimes hyperaemia. Except for an occasional history of malarial attacks I made out no association with other diseases. In no case did I find Xerosis of the conjunctive. I have also seen a good many cases of hemeralopia in civil practice.

Fuchs thinks it questionable whether hemeralopia may be due to dazzling of the eyes by a bright light but he mentions that tinted glasses and, in severe cases, rest in a dark room are indicated in the treatment. I used to treat my cases with tinted glasses/

glasses or an eye shade. Some recovered but several otherwise healthy young soldiers had to be invalided. I think it probable that Idiopathic hemeralopia, like cataract, is comparatively common in Northern India, being due to glare. Hitherto I have not, in my cataract cases, made enquiry regarding a possible history of hemeralopia. It will be interesting to go into this matter in the future.

Other Etiological Factors.

Heredity. Maynard's ⁽¹⁰⁾ statistics support the opinion of Berry and others that there is undoubtedly an hereditary tendency, chiefly through the males. The tendency is not to one particular form of cataract and in the offspring the tendency seems to be for the earlier forms of cataract to appear.

In Maynard's series a family history was forthcoming in 84 out of 357 cases enquired into i.e. in 29.93%. He notes that the more intelligent the patient the more often was such a history forthcoming. In 30 cases the father had had cataract, in 22 cases the mother, in 14 a brother, in 1 a sister.

Five had more than 1 relative affected and in 1 case/

1 case there was a history of cataract in 3 generations. The younger generation seemed to develop cataract at an earlier age than the parents. Berry records a history of cataract extending through 5 generations and affecting 55 members of the family.

Baudon⁽⁹⁾ gives a history of 12 cases among 17 individuals in 3 generations. I have myself seen several well marked examples of this hereditary tendency.

Diabetes. Pope in a series of 4,000 Extractions published in 1896 notes the occurrence of diabetes in many of his Hindu patients.

Drake-Brockman⁽¹¹⁾ thinks that the nature of the food of Madras Hindus influences the formation of diabetic cataracts.

Maynard⁽¹⁰⁾ in 1000 extractions found Diabetes present in 6 cases. In 3 of the cases aged 30, 35 and 36 there was a family history of cataract. The urine was tested for sugar in 145 cases.

Smith⁽¹¹⁾ in 1804 cases notes 7 diabetics.

Neve⁽¹¹⁾ in 1000 cases notes 13 diabetics.

I have seen several hundred cases of senile cataract/

cataract and many cases of diabetes and have not yet seen the two associated. My diabetes cases have been without exception town dwellers mostly of well to do castes. My cataract cases on the contrary have mostly been villagers. Diabetes is very common in Bengal especially among the town dwellers yet cataract is not prevalent in Bengal compared to other parts of India.

Green in a series of 425 cases notes that diabetes affects town dwellers whereas cataract affects cultivators.

(10)
Maynard does not believe that diabetes is a cause of cataract. He says "This disease is very common in Bengal yet no one I have ever asked believed in any connection between diabetes and cataract. It is one of those errors founded on impression which is perpetuated in every book published."

Maynard considers the matter from the cataract side only. With regard to the 6 diabetics in his 1000 cataracts he says "Three of the patients had a family history of cataract. The cataract might just as easily be put down to heredity as to diabetes."

Looking at cataract from the side of diabetes we find that a certain percentage of diabetics do develop cataract.- 9% according to Williamson - but the/

the cataract occurs irrespective of age and usually matures rapidly. It is therefore a true diabetic cataract not a senile cataract. In a case of cataract we may have 3 possible factors present. - diabetes - hereditary predisposition to cataract - and senility, and in such a case we cannot say which is the predominant factor. No doubt some cases of cataract in old diabetic patients are not true diabetic cataracts but senile cataracts. Such would be characterised by slow development.

Diet. In India a good deal has been written about the relation of diet to cataract but nothing definite has been discovered. Atheroma and deficient renal excretion have been adduced as causes but these theories have few supporters.

Indian experience is certainly against them. Schoen's theory of accommodative efforts due to Ametropia being the cause likewise has few supporters and here Indian experience alone would seem to disprove it. Errors of refraction in the native patient are rare and the great majority of them being illiterate cultivators seldom require to accommodate strongly.

To recapitulate - The chief factors in the causation of senile cataract are - /

of senile cataract are -

1st Senility - the word being used in a restricted sense. With increasing age the normal lens becomes sclerosed as to its nucleus - this is a physiological change comparable to the hair turning grey - but opacity of the lens cortex is a pathological change and as often as not it occurs in persons free from other senile disease. It is not, as far as we know, secondary to, or dependent on other senile changes.

2nd - An hereditary tendency -

3rd - Other conditions which lower the nutrition of the lens; the only such condition that can be demonstrated being exposure to dry heat and glare.

References.

- (1) (2) (3) (7) (13) (9) quoted in Norris & Oliver's System Vols. III & IV
 (4) (5) Indian Medical Gazette. Special Ophthalmic Number June 1901
 (6) (10) Maynard J. M. G. Feb. & March 1903.
 (8) Hirschberg quoted in J. M. G. July (?) 1904.

CHAPTER III.Diagnosis.

The diagnosis of the uncomplicated senile cataract is an easy matter except in the very incipient stages. The differential diagnosis of the varieties and stages of the disease and the exact diagnosis of the condition in complicated cataract; these are more difficult matters and they have an important bearing on the questions of operability and treatment.

Though, as I have said, the diagnosis is an easy matter yet it should be a rule that no case is operated on without first being examined by the Dioptric test with the ophthalmoscope.

In the examination of cataract cases I used to instil Atropine as a routine measure except in cases with raised tension or when cocaine produced sufficient dilation. I have never observed any ill results follow the careful use of Atropine. A drop of Eserine is instilled at the conclusion of the examination. More recently however, bowing to the opinion of many recognised authorities, I have used Homatropine Hydrobromide and Euphthalmin as being safer/

safer and, as I have gained in experience, I have found less occasion for dilating the pupil preparatory to examination.

The lens in old age, being harder, has an increased refractive index and, in consequence, there is a considerable reflection of light from it when examined by either daylight or by focal illumination and this may well be mistaken for a cataract in old persons with defective vision from other causes.

Young hospital assistants have several times brought me supposed cataract cases under this error.

Brudenell-Carter relates how he was asked by a well known London physician to perform extraction for a lady whose lenses were perfectly transparent.

If only for instructional purposes in hospital practise the routine dark room examination should always be carried out.

Diagnosis of the Stages of the Disease.

The pupil may have to be artificially dilated for the detection of incipient cataract. Few incipient cataracts come to us in India.

A good subjective test for ripeness of cataract is the advent of inability to count fingers. In the/

the few incipient cataracts I see I tell the patient to come to me at intervals if he lives near, but, if his home is several days journey from the hospital, as is often the case, I tell him to come when he can no longer count fingers. Fuchs points out that this test does not hold in the case of black cataract.

The common objective test of maturity is the presence or absence of the iris shadow on the opacity. Some over-ripe cataracts also show this shadow. I have seen many cases of this, over-ripe cataracts being very common in Indian practice. The differential diagnosis is easily made as a rule, for, as Berry points out, the unripe cataract has a convex and the over-ripe a flat anterior surface; moreover there are usually other signs of over-ripeness, such as capsular opacity, tremor of lens or iris, depth of anterior chamber. Fuchs⁽¹⁾ mentions that the dark ring of uveal pigment on the margin of the pupil may be mistaken for the shadow of the iris. It is present of course all round the pupil and not only on the side from which the light thrown.

The over-ripe cataract is easily diagnosed - the lens instead of showing stellate markings having a homogeneous appearance or being marked with more densely/

densely opaque spots owing to the anterior capsule becoming opaque - the anterior surface of the lens is flat - the anterior chamber has lost the shallowness of the earlier stage.

Diagnosis of the Consistence of the Cataract.

I refer here to the varying consistence of senile cataract. The most important factor in the obtaining of a good result is unquestionably the removal of the cortex and the removal of the anterior capsule, if this is opaque, from the position of the pupil.

According to our diagnosis of the condition of the cortex before operation we can modify our prognosis and to a certain extent our operative measures.

⁽²⁾Maynard in his exhaustive analysis of 1000 consecutive extractions made observations in 517 instances of the appearance of the lens before operation and the condition of the capsule, cortex and nucleus after removal.

Here are some of his figures bearing on the point I am discussing.

Appearance of lens before operation.	Consistence of cortex.		
	Solid or glutinous	Liquid	Sago-like
Milky white 129.	21	80	28
Glistening white cectors 58.	12	12	32
Grey uniform 110.	67	18	20
Grey striated 46.	18	4	24
Brown 67.	57	3	0

His figures show that when the lens before operation has a milky white appearance we usually find that the cortex is liquid or sago-like but we also see that in lenses having a similar appearance before operation the consistence of the cortical matter may vary.

Similarly the size of the hard nucleus usually varies directly with the age of the patient yet we see numerous exceptions to the rule.

A careful inspection of the colour of the lens with the pupil dilated gives us a fair idea but not certain knowledge as to the consistence. The exceptions to the rule are pretty numerous and I do not think that it is a sound procedure to diminish the size of the incision on the probability that the hard nucleus is small and the cortex liquid or sago-like, judging from appearance before operation.

The error of making the incision too small, causes bruising of the iris and cornea, prevents easy evacuation of cortex and increases the ever present danger of escape of vitreous.

The mistake moreover is difficult to rectify. In my own operations and in the operations of other surgeons/

surgeons I have noticed that several attempts have sometimes to be made before the incision is successfully enlarged with the scissors. The tissues of the cornea or limbus, as the case may be, being no longer kept rigid by intra-ocular pressure seem to fold between the blades of the scissors as one's finger nail often does when we use the left hand to cut a right finger nail. This must cause considerable bruising of the cornea, The results of making too small an incision all increase the risk of wound infection and destruction of the eye.

With regard to this mistake Knapp says "A too small section of the cornea is the worst mistake the operator could make according to the testimony of many earlier and modern authors with which the present writer entirely agrees."

For my part I think that writers on cataract extraction have made too light of the difficulties and dangers consequent on making an insufficient wound.

The diagnosis of the consistence of the cataract may however be confirmed by a measure which is apparently never used in Europe and regarding which I can find few references in the literature of cataract./

cataract. I refer to the preliminary laceration of the capsule, a measure which has been the routine practice for years in the Madras ophthalmic hospital. I shall discuss this measure in detail when I come to the question of operation but I mention it here as it forms by far the best means of ascertaining the nature of the cataract and devising an operation accordingly e.g. suppose we are dealing with a milky white cataract; we know that the cortex is probably fluid but it may be solid or gelatinous. The doubt is removed by preliminary needling of the capsule for if the cortex is fluid, as in a Morgagnian cataract, the needle point sinks readily and a cloud of turbid fluid escapes. We may then confidently make our incision a small one and perform the simple operation.

If on the contrary the cataract is a hard one it will recede before the pressure of the needle and we know that the combined operation with a large incision is indicated.

It may be said that this escape of turbid fluid from the lens into the aqueous will obstruct the view in making the incision but this disadvantage is/

is more than compensated for by the deepening of the anterior chamber which also occurs in such cases.

The following cases of my own, exemplify the points I have been discussing - the uncertainty of diagnosis of consistence of the cataract founded on inspection alone and the complications of a too small incision.

Case I.

Jhallawar Rajputana. 1903.

Rajput male aged 60. R. eye successfully operated on some 5 years ago. L. eye a prominent eye with a milk white opaque lens. Focal illumination and ophthalmoscope show eye to be otherwise normal.

Operation 10th Aug. Antiseptic irrigation. Corneal flap. Incision in limbus. Iris presented in wound and during iridectomy lens presented and then came out spontaneously. A large hard yellow cataract. The capsule evident by gave way and the soft milk coloured cortical matter came out before the nucleus. Some sticky matter - stringy blood and iris entangled in R. corner of wound. I removed some of this and replaced iris. Wound gapes a little. Atropine instilled. Vision good, pupil black.

1st/

1st - 8th day. Case has done well, only there is some conjunctival redness and the iris has got caught at the end of the wound. Atropine again instilled to-day.

19th. Redness less.

20th. The same. Atropine, and blister to temple.

24th. Bandage left off.

30th. Discharged cured. Vision good.

In this case there was a milk white cataract and yet the nucleus was large, hard and yellow. Had I made a small incision the result would probably have been bad, for the Zonule evidently gave way and a vitreous prolapse would certainly have followed the manipulation consequent on a small incision.

Case II.

Mandana Dispensary Rajputana.

October '03. Hindu woman age 50. L. eye mature cataract. Pupil reacts well. P. L. good. Incision too small, large escape of vitreous before delivery of lens; wound enlarged after removal of speculum and lens delivered with help of vectis. Great loss of vitreous - the lens was large and hard. Result not/

not ascertained but noted as bad. The R. eye was at the same time successfully operated on.

This case was one of the four done while visiting the dispensaries in my district. I was indifferent health at the time and having ridden far that morning was shaky. My assistant was ignorant and very nervous as the occasion was that of his annual inspection. Our nervousness evidently communicated itself to the patients who I recollect were all unruly. Out of the four extractions I did that morning only 2 were successful. I have since then given up doing extractions when on short visits of inspection. In this case preliminary needling might have shown me that the cataract was a hard one. The evil result of an inadequate incision is exemplified.

Case III.

Multan. Punjab. (Private Case).

Mahomedan cook - age 50 - both eyes cataractous.

L. eye ripe operation 23/3/1900. Corneal incision; too small, and had to be enlarged with blunt pointed scissors/

scissors. No iridectomy. Capsulotomy; lens came away seemingly in two pieces, much soft cortex.

27th doing well. Result good.

The notes of this case are scanty but here a good result was obtained in spite of the initial mistake.

Case IV.

Tonk. Rajputana.

Chamar aged 57. Admitted 22/1/04 and examined in dark room after instillation of Atropine. T. normal in both eyes. Conjunctiva moderately healthy looking. R.E. nearly ripe cataract. Anterior chamber shallow. L.P. good. Pupil reacts well, dates from 6 months according to patient. L.E. duration $1\frac{1}{2}$ years conditions much the same as in right eye but mature; lens milky.

L.E. operation same day 22/1/04, preliminary irrigation with Hyd. Perchloride 1 in 4000. 6 squeezes of swab. Incision in cornea well forward. Iridectomy - Capsulotomy - lens too big to come out therefore wound enlarged internally with scissors - Delivery of large nucleus - Could then see through black pupil.

At/

At attempted toilet of eye slight escape of vitreous. Iodoform and firmly applied dressing. Ferris's sterilised pad used.

Opium eater therefore ordered full dose of liq. Morph. Hydrochlor. Eye was treated daily with Iodoform and Atropine.

25/1/04. No finely powdered Iodoform was available and a Chrystal of Iodoform has evidently got lodged in wound and then entered anterior chamber where it can be seen. Pupil black. A good deal of conjunctival injection, otherwise no bad symptoms and he can count fingers.

I left on 27th January.

5th February. Dr. Miss Reed reports that eye is a little inflamed and the chrystal of Iodoform has disappeared.

8th Febuary. Discharged - Result very good.

This extraction was done during a 10 days visit of Inspection. I should like to have got the conjunctiva into a more healthy condition but had I deferred operation the patient would have left: I therefore used antiseptics before and after operation. The extra manipulation due to the smallness of the incision/

incision no doubt tended to the vitreous escape. Preliminary needling of the capsule would have revealed the presence of a large hard nucleus and I would, in consequence, have made a large incision. The penetration of the anterior chamber by the Iodoform Chrystal is of interest.

The above 3 cases, II., III., and IV. are the only ones in which I have had to enlarge the wound with scissors. In two out of the three there was an escape of vitreous.

Case V.

Jullundur (Private case).

Mahomedan female, age about 70.

Left eye shrivelled completely.

R. eye complete amber coloured cataract - a fairly prominent globe. Perception of light present. Iris reacts normally. Operation 1/12/99. Knife entered in cornea close to margin nearly $\frac{1}{2}$ of cornea in flap. Small iridectomy. On opening the capsule the aqueous became mixed with cloudy matter at once. Cataract/

Cataract delivered easily and then a lot of cortical matter was coaxed away with spoon. Sight seemed to be fairly good. Boro Iodoform and Atropine instilled.

15/12/99. Wound has healed up nicely but there is still some redness.

25/12/99. Redness persists - can see and count fingers.

28/12/99. Discharged cured, with useful vision. No lenses available to test vision accurately.

I quote the case to show that in an amber coloured cataract which we would expect to consist almost entirely of hard matter, we may yet find a considerable amount of soft cortex. Here again Preliminary Laceration of the capsule would have shown that the case was an exception to the rule, that the hard nucleus was not so large as the appearance before operation suggested.

This case was evidently an unripe stage of the Morgagnian cataract the fluid not being sufficiently advanced to allow the nucleus to alter its position.

Diagnosis of Complicated Cataract.

Complicated cataracts are very commonly met with in/

in Indian hospitals which renders systematic and thorough examination advisable in all case; the more so as it is difficult to get a reliable history which might put us on our guard in some cases.

Complicating disease in the anterior part of the eye may go undetected if the eye is not systematically examined in the dark room.

Thus small deposits on the posterior surface of the cornea, pretty considerable posterior synechiae and even seclusio pupillae, before the iris has become atrophic, may escape detection by mere daylight examination.

Where we have reason to suspect complications e.g. a history of former eye trouble, pigment spots on the anterior capsule, deposits on the posterior surface of the cornea, irregularity or sluggishness of the pupil - then a mydriatic should be instilled and a thorough dark room examination carried out.

The tension of the eye should of course be noted in every case.

Complicating disease of the deeper structures of the eye can sometimes be detected by the careful estimation of light perception and projection.

This/

This test must be carefully performed in the case of illiterate and stupid natives. The patient must be made to point to where the light is and the surgeon must carefully avoid asking leading questions.

In such cases the previous history of the eye may be of value in helping to form a diagnosis.

For example: -

A Hindu, aged 50 to 60 years came to me with double cataract. He had prominent eyes and, on enquiry, gave a history of poor distant vision for which he had worn glasses - in fact a clear history of myopia was forthcoming - Light projection was not carefully tested.

I performed extraction on the R. eye. Subsequently ophthalmoscopic examination showed a small detachment of the retina in the lower part of the fundus and posterior Staphyloma. I was transferred from the place but heard that the eye soon after became quite blind.

The history should have put me on my guard and caused me to test the power of light projection carefully.

In the Kurram Valley where I first treated cataract/

cataract the hospital was a mud building and was scantily equipped - dark room, lenses and ophthalmoscope were all wanting. I had not then grasped the importance of making careful examination as to complications, light perception and projection. I was content with maturity of the cataract judged by the shadow-test and reaction of the pupil to light in a fairly healthy eye.

Fortune was kind to me for I had no case of an operation, in itself successful, being followed by blindness from disease of the fundus till the year 1900 when the following case occurred.

Case VI.

Multan. Punjab. (Private case.)

Mahomedan tailor - complete double cataract - a youngish healthy man. R. eye done on 15/2/1900 under CHCl_3 . 3. Mr. F----- I.M.S. operated. The iris fell before the knife and the lens came out involuntarily - a good deal of haemorrhage. 17th. Dressed - eye quiet but no vision at all. The patient made no improvement as to vision and left/

left before we could examine the fundus.

The notes are brief but it was not improbably a case of simple glaucoma.

Since this case I have invariably made a dark room examination before operating.

(1) Fuch's Ophthalmology (2) J.M.G. Feb & March 1903.

CHAPTER IV.

Operability.

I shall discuss the question of operability not from the standpoint of the skilled specialist but from that of the surgeon of average skill, who does on an average about half a dozen extractions a month. Most of the surgeons in India, myself included, are in this class.

As regards operability generally he must bear in mind that he is the only surgeon within reach of the people and, if he does not gain their confidence cataract cases will not come to the hospital and thus many eyes will be lost. In outlying districts particularly, the native even when suffering pain and//

and inconvenience is inclined to hang back till the surgeon has proved his worth by successful operations.

This condition of affairs is common because transfers of medical officers are common. It is to these outlying districts that the junior surgeon is sent and with his first cataract cases he must exercise a nice discrimination as to operability. His own professional well-being and the good of the community are equally at stake.

Moreover, having decided as to operability and prognosis, he must take the entire responsibility, as a rule, of advising operation or the contrary. With an educated patient the risks of an operation may be discussed and it is left to him and his friends to decide whether the risk will be run. Tell a native that the prognosis is bad and he will as often as not leave the hospital forthwith. Or again, the native patient may elect for a risky operation and if failure results he will say to the surgeon "It is the will of God, Sahib" but the village community will blame the surgeon and other cases in that part of the neighbourhood will put off coming for treatment or come not at all. I shall now go into the question of operability in detail from the standpoint of the surgeon/

surgeon of average skill.

General Health.

In the absence of acute disease there are few contra-indications but very old people, feeble physically and mentally, should be left alone.

Diabetes and Albuminuria are not contra-indications but, if the Albuminuria is accompanied by oedema, the case should be rejected. The importance of cough as a contra-indication is, I think, over estimated. Most natives have a morning cough and the increased risk, if there is any, must be taken.

Opium eaters were pretty common in my experience in Rajputana and I had several as cataract patients. As is to be expected they are untrustworthy and in their after treatment they require Morphia or Opium in accordance with their habitual use to keep them from becoming restless. Otherwise there is nothing noteworthy about this type of case.

Local Conditions.

Malformation of eye. Maynard, by a series of measurements of the cornea, shows that in Asiatics there/

there is a great variation in size and that on an average the cornea is smaller in the Asiatic. Herbert quotes a case where extraction was impossible owing to congenital smallness of the cornea in both eyes. He depressed both lenses. The fact of the eye being small and deep set adds greatly to the difficulty of the operation and this factor should be taken into account in deciding as to operability. The two following cases VII. and VIII. are examples of this and case IX. shows the difficulty of successfully treating a patient of weak intellect.

Case VII.

Mooltan 1899. (Private case)

Woman about 55 years. Ripe cataract both eyes. P.L. both eyes, small globe in deep socket. R.E. operation 1/12/99. Modified peripheral linear incision. As distal puncture was being made she moved the eye and a fresh puncture had to be made. A small haemorrhage followed at site of puncture; a ragged wound. She continued to move the eye and the piece of conjunctiva gripped by forceps came away. This happened during the iridectomy. Iris prolapsed/

prolapsed: iridectomy. The lens seemed to have started from its bed so capsulotomy was not performed. Cataract was a large one but came away easily. Some escape of vitreous and haemorrhage. Could see but could not count fingers. Eye thoroughly irrigated. Boro.Iodoform and Atropine. 20/12/99 Wound healed, much redness and an appearance something like a Pterygium from inner canthus to cornea. Can see and count fingers. Blisters to temple. The wound extended too far into the sclerotic. Improved slowly - cured 30/12/99. Vision good. Comment. This case made a good recovery in spite of an ill executed operation.

Case VIII.

Mooltan. (Private case.)

Same patient as case VII. L. eye operation 3/1/1900. incision made well forward in cornea as the eye was small and deeply set and therefore difficult to get at. Patient moved eye a good deal and incision was rather ragged. Combined method. Capsulotomy done with difficulty owing to movement and depth of eye/

eye socket. No accidents.

Suppurated from 4th day; little pain and slight discharge. Wound gaping and anterior chamber full of yellow matter. Patient absconded. Result bad.

Comment. Though none of the recognised accidents happened I remember that this was a troublesome case on account of the eye being so small and deep set.

Case IX.

Bikanir 1904.

Rajput male aged fully 60. - of poor physique and weak intellect - double cataract.

24th August. Examined in dark room. R. eye of longest duration. R, eye capsule pearly white probably hypermature. P.L. good. Iris healthy. T. normal. L. eye cataract mature, brownish in colour. P.L. fair. pupil a trifle irregular and sluggish. Internally a capsular opacity with dark centre probably an old Synechia.

R. eye operation 25th August. Preliminary laceration of capsule - usual incision. Iridectomy followed by prolapse of margin of coloboma.- this also exercised delivery/

delivery of large cataract. Irrigation of anterior chamber, replacement of iris. Atropine and pad. Wound came together beautifully.

26th. Bandage twice removed by patient who was very restless and continually trying his vision.

28th. Eye suppurating. Enucleation performed.

Pterygium. This I shall take apart from the consideration of the conjunctiva. It is an extremely common condition in India. When the cornea is invaded extraction should not be done till the Pterygium has been removed, for two reasons,
1st. Bleeding often occurs at the internal puncture for the Pterygium usually occurs on the nasal side. This bleeding disconcerts the inexperienced operator and obscures the further steps.

2nd. The Pterygium by pulling on the cornea may cause the wound to gape and thus prevent or delay healing, adding to the risk of infection. The native patient does not grumble much at the extra time required for the removal of the Pterygium for he knows that something definite is being done.

Corneal Opacity. If the cornea be clear enough to allow the state of the lens and pupil to be noted there/

there is no contra-indication.

Unripeness. The cataract should be fairly ripe but complete ripeness is not essential.

Hyper-Maturity. Over-ripe cataracts are exceedingly common in Indian practice. Over-ripeness in itself is no contra-indication but such cases must be carefully examined for complications such as increased tension or tremulous lens.

A slight trembling of the Iris may occasionally be present in a normal eye but when the condition is marked and especially if the lens also be tremulous then we know that the zonule has probably given way and the case should not be operated on. An escape of vitreous - the vitreous in such cases often being fluid - would probably occur. I have seen a good many such cases in over-ripe cataracts.

Case X.

Deoli. Rajputana. 1903.

Nani - Hindu female aged 50 double cataract examined focally and ophthalmoscopically.

L. eye immature. R. eye over-ripe anterior capsule shining and puckered - lens slightly tremulous.

P.L. good./

P.L. good.

R. eye operation 24th Dec. simple operation - lens extracted in its capsule. Incision well in front of plane of iris - free escape of rather fluid vitreous with and after delivery of lens. Toilet of conjunctiva done before lens was expelled. Eye was immediately closed on delivery of lens.

25th. 1st. day eye dressed. Piece of shrunken vitreous removed from surface of cornea lower margin of wound slightly everted but no prolapse of iris - wound being well forward. Atropine instilled. Perception of light is good.

2nd. day. Lower lip of wound looks sloughy. Cocained and painted with Ag No. 3 solution gr. XXX to $3\frac{1}{2}$ and eye well irrigated. Atropine.

3rd. day. Eye injected - wound more sloughy looking - free irrigation of eye. Atropine. Iodoform. Very lightly bandaged as lower lid is becoming inverted.

4th. day. Condition and treatment the same.

5th. day. No spread of suppuration.

6th. day. " " " " Discharge more free, shade only during the day.

Patient left during my absence, with eye somewhat shrunken.

Result bad./

Result bad.

Five months later the L. eye was successfully operated on.

Synechia if present contra-indicates operation.

The complication makes the operation more difficult and the ultimate prognosis bad.

Case XI.

Rajput male aged about 45. L.E. glaucoma - blind
R.E. T+ conjunctiva slightly injected anterior
chamber shallow - lens opaque - admitted 4/8/02.
5th August. Operation. Cocaine dilated pupil but
showed posterior synechia as pupil dilated
irregularly. The importance of this I did not
grasp. Adrenalin Solution blanched the conjunctiva
at once. Incision made in cornea as usual then an
iridectomy, too small, - capsule scratched, letting
out some fluid cortex. Then I made pressure but
only some semi-hard cortex came away. Thinking
wound too small I enlarged it. Still no delivery
and I saw then that the lens capsule was strongly
adherent/

adherent to the iris. I introduced a sharp hook and there was at once an escape of rather fluid vitreous. I think the hook got beyond lower edge of lens and pierced suspensory ligament. As result of further efforts at delivery the lens became dislocated into the vitreous. Iodoform and a firm pad.

1st. day. No pain - left alone.

2nd. day. Cornea cloudy.

29th. August. 24th. day. Eye has slight vision.

Result bad.

In this the raised tension and the complicating synechia both contributed to the bad result.

Dislocated lenses.

In India one sees a good many cases of spontaneous and traumatic dislocation of the lens and even a greater number of couched lenses. These cases often come for the relief of pain only, vision having been entirely lost through secondary glaucoma. It is best not to interfere with such cases unless to enucleate at the request of the patient.

In May 1904 I met a villager who had useful vision in the R. eye the result of a couching operation/

operation. His left eye was shrunken the result of an unsuccessful extraction in a government civil hospital. Truly, an unique case!

Increased Tension.

Increase of tension is usually accompanied by a passive congestion of the eye tissues and, if extraction is performed, bleeding from the iris or from the deeper structures often occurs; and there is, in addition, the risk of early loss of vision from progressive fundus changes.

(1)
Neve in a series of 1000 extractions notes that he performed extraction in 8 cases with increased tension, four of which were distinctly glaucomatous - out of these 8 cases there was 1 failure and 4 cases of poor vision.

(2)
Herbert publishes note on 12 cases of subacute congestive glaucoma of which senile cataract appears to be in part the cause. According to him these cases can be distinguished from ordinary primary congestive glaucoma by the fact that the anterior chamber is not deepened but very shallow, and the high tension gives way to the action of eserine. According to Herbert the correct treatment in such cases/

cases is early extraction with iridectomy.

On 8 of the 12 cases he operated with success.

He may be right but the operation is contra- indicated for the average operator.

If tension is raised to more than +1 or diminished to less than -1 operation should be refused.
See case XI. and also the following case.

Case XII.

Deoli. Rajputana.

Mahomedan male 55 years admitted 26/6/04.

L. eye duration $\frac{10}{12}$. R. eye duration $1\frac{6}{12}$. Examined in dark room. R. eye central corneal opacity size of pin's head - immature cataract. Anterior chamber deep T.+ P.L. good.

L. E. immature cataract.

R. eye operation 28/6/04. In cision in margin of clear cornea - in making conjunctival flap I finished the incision in sclerotic - large iridectomy.

Capsulotomy; the lens delivered itself, patient moving eyes considerably but no actual spasm of orbicularis. Speculum at once removed but prolapse of vitreous followed. Vitreous incised. Iodoform and/

and bandage - full dose of morphia as he is an opium eater.

30/6/04. Artificial leech to temple ³~~it~~ blood taken
1/7/04. Has been dressed daily. Since operation
there has been constant ~~ly~~haemorrhage coming through
dressings till to-day when there was less. Iodoform
and pressure. Result bad.

The complication makes the operation more difficult
and the ultimate prognosis bad.

References.

- (1) Nere. J. M. G. June 1901
- (2) Herbert J. M. G. June 1901

CHAPTER V.

The Condition of the Conjunctival Sac with Reference to Operation.

Acute and subacute inflammation of the Conjunctiva
and Dacrys-cystitis contra-indicate operation. When
we have to deal with conjunctivæ from which there is
slight discharge and also with apparently normal eyes
the question becomes complicated and brings us to the
consideration of bacteriology, ~~ant~~isepsis and asepsis
in opathalmic surgery.

Much has been written about the bacteria found
in the normal and diseased conjunctiva but little has
been/

been done towards ascertaining the relation of the organisms found in the conjunctiva to operative procedure and formulating rules of procedure in this connection.

In fact no branch of operative surgery has been benefited so little from antiseptics and asepsis as eye surgery.

In 1866 before the practice of antiseptic methods in India, George Smith⁽¹⁾, writing on cataract, noted the following results.

In 1863 Archer in Calcutta had 16.5% failures. Macnamara in Bengal 75% cured, 10% relieved, 15% failures.

Von Graefe⁽²⁾ at that time considered his results to be as follows -

65% complete success, 15% success after secondary operations, 7% useful vision, 6% very little vision, 7% total failure.

Macnamara⁽³⁾ in 350 extractions had 14% failures.

In India suppuration is still by far the commonest cause of failure in cataract extraction. The following figures prove this.

Maynard⁽⁴⁾ 1000 consecutive extractions.

45 failures of which

36 were due to Sepsis.

5 " " " Intra-ocular haemorrhage.

1 was due to Detached retina.

2 were due to Iritis.

1 was due to Irido-cyclitis.

In the same series there were 57 indifferent results and in some of these cases the poor result was due to Sepsis.

Drake-Brockman⁽⁵⁾ 1626 cases - 5% failures ,
of the failures -

51.6% due to Suppurative Keratitis.

29.0% " " Iritis.

4.0% " " Irido-choroiditis.

14.0% " " Suppuration of eyeball.

Neve⁽⁶⁾

711 Extractions.

5 Cases of Panophthalmitis.

6 " " Septic infiltration.

Of my own failures over 50% have been due to Sepsis.

Taking into account the improvement in instruments and technique and above all, the discovery of local anaesthesia, I do not think that present day results show an advance upon the results of pre-antiseptic practice commensurate with the advance in operative surgery/

surgery generally.

When suppuration does occur the probability is that the wound becomes infected from a previously infected conjunctiva, for we know that in general surgery it is rare for a wound to become infected. In general surgery the tissues are much exposed to infection from contact with hands, instruments, swabs and ligatures. In eye surgery our instruments are few and easily sterilised.

Asepsis is doubly important in eye operations for, if we fail to obtain primary union, the eye is almost invariably lost; the operation is a failure. In general surgery wound infection, as a rule, only entails a more prolonged healing process. Granted, then, that suppuration is most often due to infection from the previously infected conjunctival sac, the following questions arise.

- A. The recognition of infectivity.
- B. The frequency of occurrence, nature and pathogenicity of the micro-organisms found in healthy and diseased conjunctivæ.
- C. The possibility of sterilising the conjunctival sac.
- D. The comparative value of antiseptics and asepsis in/

in treating the conjunctiva before operation.

- A. The recognition of infectivity cannot be made by mere inspection and by the presence of discharge.

Maynard in 36 failures from Sepsis after extraction noted -

in 14 cases discharge was present before operation.

in 11 cases there was no discharge.

in 209 cases mucus ~~was~~ present with 15 i.e. 7.16% indifferent and bad results.

in 490 cases no mucus present with 38 i.e. 7.76% indifferent and bad results.

The presence of a discharge is of course evidence that the conjunctival sac contains pathogenic micro-organisms but the converse is not true; that absence of discharge means absence of organisms. This is indicated by the figures quoted and has been proved by Bacteriological research.

- B. The micro-organisms found in the healthy and diseased conjunctiva; their frequency of occurrence, nature and pathogenicity. These are subjects of much dispute but the majority of observers is agreed/

agreed that organisms e.g. xerosis bacillus, staphylococcus albus, are very commonly found in normal eyes and that others staphylococcus p. aureus, streptococcus, pneumococcus and other diplococci are more rarely present. I have myself found all of these in apparently healthy eyes, with the exception of the pneumococcus.

As regards their pathogenicity Fuchs⁽⁶⁾ considers that the organisms found in the conjunctival sac are of little account and that infection, when it occurs, is due to the instruments, but it has been proved by Hildebrandt and Bernheimer⁽⁷⁾ that various germs such as staphylococcus p. albus and aureus may be present in an eye in which, after extraction, the healing has been normal; while inoculations of the secretion from this eye will cause suppurative inflammation in the cornea of rabbits and that the healthier the animal the less the degree of inflammation.

The effect of the presence of pathogenic organisms depends on, 1st the virulence of the organism; 2nd the power of resistance of the tissue; 3rd the number of germs introduced into the tissue.

The/

The first condition - variation in virulence is a well known phenomenon in bacteriology and is of great use in the production of artificial immunity.

The second condition - varying power of resistance of the tissues - is well seen in the frequency with which contused and lacerated wounds suppurate as compared with incised wounds. This applies to ophthalmic as well as to general surgery. The third condition has often been demonstrated in the laboratory.

To these uncertain factors we must add the question of mixed infections, for it has been proved that the virulence of an organism may be raised by injecting along with it a culture of another organism either in the living or dead condition.

Admitting our knowledge of the pathogenicity of these organisms to be incomplete, can such knowledge as we possess be utilised towards the elimination of Sepsis from our operations? I think it can and shall now give examples.

Case XIII.

Hindu female aged 60 double cataract of several years duration, eye small and deep set. Pupil reacts well.

Examined/

Examined in dark room on 17/7/04.

R.E. very nearly mature.	}	L.P. good, T. normal.
L.E. fully mature.		

No injection of conjunctiva but some discharge.

Dry films from both eyes were made and stained with Methylene-blue and by Gram's method. Staphylococci and streptococci were found to be numerous and there were other organisms which I could not identify.

The eye was therefore treated with AgNO_3 solution gr.X to $\frac{3}{4}$ at first, and then with Boracic Solution; the discharge grew less but a little remained.

A second bacteriological examination the day before operation showed no streptococci, no staphylococci but a few organisms not identified.

27/7/04. R. eye operated on. Sublimate irrigation preliminary laceration of capsule - much fluid cortex therefore small corneal incision and extraction without iridectomy. Atropine and bandage.

On the 1/8/04 the fifth day after operation there was some infection and discharge. Nitrate of silver was again applied; for lack of staining re-agents no further microscopic examination was made.

The case recovered with good vision.

The left eye of the same patient was treated with/

treated with Silver Nitrate and Boracic lotions till the discharge was practically nil and on 25th August the lens was extracted in its capsule. The result was good.

In the above case I have noted that there was nothing abnormal about the conjunctiva except slight discharge and but for the microscopic examination, which was done more as an interesting experiment than as part of the diagnosis, I would have operated the next day or a few days after admission and it is not unlikely that suppuration would have followed.

The following cases are recorded by Fergus.^{8.}

- (1). A senile cataract was extracted by a surgeon from patient's R. eye - the next night violent pain came on and the eye ultimately atrophied from acute suppuration or from irido-cyclitis. She then came to Fergus to have the other eye done. Streptococci were found to be numerous. A fortnight passed before the condition of the conjunctiva warranted operation. Extraction was performed with a large conjunctival flap. For 10 days all went well and the wound/

wound healed; then pain occurred in the eye and an acute conjunctivitis ensued. Streptococci were found to be abundant in the discharge.

Comment. In this case there was nothing in the appearance of the L. eye to contra - indicate extraction but from the presence of streptococci before and after the operation it is extremely probable that the R. eye was lost from streptococcal inflammation, and that the temporary cleansing of the conjunctiva saved the L. eye.

- (2). Three children in hospital at the same time each suffering from penetrating wound of the cornea with traumatic cataract. Of these 3 eyes, one was quiet and free from irritation; in the conjunctiva there were no micro-organisms or only innocuous ones.

In the second case the eye was extremely irritable, there was acute catarrhal conjunctivitis and in the discharge pneumococci were abundant - this eye developed hypopyon with irido-cyclitis and had to be enucleated.

In the third case the eye was extremely irritable, there was acute catarrhal conjunctivitis, staphylococcus p. albus was abundant. This eye made a good recovery./

recovery.

- (3). Patient who had had one eye operated on for a cataract resulting in intense suppuration and destruction of the eyeball. On both sides the conjunctival sac was found to contain streptococci. With difficulty the streptococci were got rid of and the lens extracted with successful result.

Comment. These cases throw some light on the pathogenicity of the streptococcus, pneumococcus and staphylococcus p. albus. They also show that the bacteriological test has a distinct bearing on the question of operation.

C. The possibility of sterilising the conjunctival sac.

Parsons after giving an account of the most recent researches sums up the matter by saying that it is generally admitted that complete sterilisation is, in most cases, unattainable.

It is also generally admitted however that the number of micro-organisms can be greatly diminished and no doubt in some cases complete sterilisation can be effected by irrigation of the/

the conjunctiva with sterile saline solution or with antiseptic fluids.

D. The comparative value of Antiseptic Solution and Sterile Saline Solution in cleansing the Conjunctiva.

There is a difference of opinion on this point among bacteriologists but surgeons still treat the diseased conjunctiva with antiseptic washes.

As Fuchs points out Silver Nitrate solution is beneficial in chronic catarrh by coagulating the albumen of the cells in the superficial layer of epithelium; the epithelial cells are thrown off - in the form of the familiar blueish-white pellicle - and the micro-organisms which mostly lie in this layer are also thrown off. Coviosive Sublimate has a similar effect.

It is uncertain whether there is a true antiseptic action in addition to the mechanical action but it seems very probable that in thorough irrigation of the sac a large number of organisms must come in contact with the antiseptic and be killed off.

I have satisfied myself by repeated experiments/

experiments that irrigation with sublimate always diminishes and sometimes entirely removes micro-organisms from the conjunctiva; and I have observed that the antiseptic has a mechanical action similar to that by which nature herself removes organisms from the conjunctival sac.

Bach⁽⁹⁾ showed that within 24 hours organisms (Kiel water bacillus and staphylococcus p. aureus) were transported from the conjunctiva to the nose.

I made several dry film preparations from my own conjunctiva stained with Thionin - blue and also by Gram's method. In some of these films I found a few staphylococci and a few xerosis bacilli.

I then massaged the lids working towards the inner canthus till a small collection of mucus appeared at the plica semi-lunaris. A smear preparation from this mucus contained a large number of the organisms already found and a number of epithelial cells.

In other eyes, healthy and diseased, I have made similar experiments with similar results. In inflamed conditions of the conjunctiva the secretion tends to collect at the inner canthus - this is of course due to the constant action of the tears aided by/

by the movements of the eye- the secretion is partly composed of micro-organisms when these are present in the sac.

Now when we irrigate the eye freely with sublimate we bring about a rapid shedding of the superficial layer of epithelium which contains many organisms if these are present. Epithelium and organisms are present in the collections of mucus which we find first on the palpebral conjunctiva - especially in the fornices - and subsequently at the inner canthus. The rest of the sac will now be found to be partially or wholly free from germs.

I have not tested the effect of saline solution on the conjunctiva bacteriologically. I am in favour of antiseptic treatment of the conjunctiva before operation for the following reasons.

1. Experiments as already stated, show that sublimate always diminishes and sometimes removes the organisms.
2. Though some observers declare that saline is as efficacious as sublimate, no observer maintains that it is more so, and some observers - e.g. Franke⁽¹⁰⁾ - obtained better results with sublimate.
3. The true antiseptic action of even weak solutions of sublimate should be taken into account.

4./

4. In practice it is noteworthy that Knapp^(u) though he remarks that "gradually the use of antiseptics has been reduced or given up, and simpler methods have proved just as efficient and less harmful" yet before operation he everts the lids and washes the conjunctiva with sublimate solution 1/5000 and during the operation he drops antiseptic lotion on wound and cornea.

Fuchs^(u) uses saline solution if the conjunctiva is normal, and sublimate 1/4000 only in those cases in which the conjunctiva is diseased (catarrh, trachoma). This appears to me to be irrational in view of his own statements :-

- 1st. that the apparently normal conjunctiva frequently contains pathogenic organisms and
- 2nd. that sterile liquids are as efficacious as antiseptics in diminishing the number of germs present.

5. Clinical experience is in favour of antiseptics as the following figures testify.

Neve.

"In 221 cases the conjunctival sac was unhealthy, being injected, or with watery or gummy discharge. After preliminary treatment these were subjected to operation/

operation. There were 10 failures, 19 poor results, 38 fair results. In 40 cases of trachoma 2 failures, 5 poor, 7 fair results. Increasing care in the preparatory treatment of these cases has steadily reduced our failures. Thus, in our last 192 cases, out of 91 cases of conjunctivitis and 5 of trachoma there was only one failure."

Neve⁽¹³⁾ treats the eye with Silver Nitrate grX to 3r followed, when the eye appears healthy, by boracic lotion 5% and out of his last 211 cases 173 were treated in this way for a period of one to three weeks before operation.

Herbert's⁽¹⁴⁾ results are very striking.

1. With 1/3000 sublimate solution freely used 497 extractions were completely exempt from grave infection.
2. With 1/3000 sublimate solution more sparingly used in 578 extractions there were 3r primary infections.
3. With sublimate solution of a reduced strength and used in smaller quantity.-

in 349 operations there were 3 cases of pano-phthalmitis and 7 closed pupils from iritis and irido-cyclitis./

irido-cyclitis.

4. With a return to the free use of a 1/3000 solution 930 extractions have been done with only 1 suppuration. (This occurred during his absence, the bandage too having slipped.)

Herbert uses a test bandage to find if there is any morning discharge - operation is deferred when possible till the eye is quite free from discharge but occasionally he operates when there still is a little discharge and rarely when there is a considerable amount.

Most Indian ophthalmic surgeons use antiseptics, but, judging from their writings, many of them do so in a perfunctory manner and as regards sepsis Herbert's results are, I think, the best in India.

Then his investigation of his own cases is all in favour of a thorough application of the antiseptic to the conjunctiva.

This cleansing of the conjunctiva is precisely similar to the cleansing of the skin before any operation. The extraction itself is done aseptically.

Herbert claims that his figures must be accepted as irrefutable evidence of the value of sublimate solution, especially in dealing with chronically inflamed/

inflamed conjunctivæ. His claim, I think, a just one.

He admits that, if used in excess, the sublimate irritates even as deeply as the iris and on this account one must be prepared to instil atropine pretty freely.

In India, where we rarely see in our cataract cases, a conjunctiva that is quite normal; where we have not the necessary staff and equipment to examine every case by bacteriological methods; and where the patient will not submit to necessary preliminary treatment; this routine practice of thorough antiseptic irrigation is strongly indicated.

The ideal procedure would be to test every eye before operation for the presence of pathogenic organisms, as was done in the cases reported at the beginning of this chapter. The presence of any well defined pathogenic organism should be held to contraindicate operation.

This laboratory examination is carried out in some eye clinics in doubtful diphtheritic conjunctivitis, Dacrys-cystitis and many other such cases. There is no reason why it should not, in European hospitals, be the routine practice before operation.

In/

In the Indian special ophthalmic hospitals it would be difficult to deal thus with the large number of cases, many of whom moreover would not wait.

The civil surgeon who does a comparatively small number of extractions should, whenever possible, make dry film preparations and, if he finds streptococcus, pneumococcus, or any other admittedly dangerous microbe to be present, he should postpone operating or, if the delay is objected to by the patient, he should then irrigate freely with sublimate.

On the other hand if neither the microscope nor the culture test reveals the presence of pathogenic bacteria the antiseptic irrigation may be reduced to a minimum.

In short; free antiseptic irrigation should be carried out except when the conjunctiva is proved to be sterile; or practically sterile; for the xerosis bacillus and staphylococcus p. albus, amongst those commonly found, may be considered as innocuous.

I have always practised antiseptic cleansing of the sac before extraction but it is only since reading Herbert's views on the subject that I have gone in for free irrigation with 1/3000 or 1/4000 sublimate/

sublimate solution.

The method of irrigation I shall describe in the next chapter.

I have reported one case of extraction in which I applied the bacteriological test with advantage. I used the microscope in other cases but not as a routine practice because, from want of facilities, my bacteriology had become rusty and I did not place much faith in my powers of diagnosis by such methods.

It is with a view to applying bacteriological methods to my ophthalmic practice that I have recently been studying pathological bacteriology in theory and practice.

- References (1) (2) (3) (5) (13) *I. M. Gazette June 1901*
 (4) *I. M. G. Feb. & Mar. 1903*
 (6) (12) *Such's ophthalmology*
 (7) (11) *Norris & Oliver's System Vols. III & IV*
 (8) *Lergus. B. M. J. March 1905*
 (9) (10) *quoted in Parsons' Pathology of the eye Vol. I pt. I*
 (14) *Herbert "Practical details of Cataract Extraction"*

CHAPTER VI.Extraction.

I shall now discuss the operation of extraction from the standpoint of the surgeon of average dexterity and limited experience.

In India for every specialist whose extractions number on occasion 20 or more in one morning and several hundred yearly there are a dozen civil surgeons who do their 10 to 50 extractions in the year. I put myself in this class.

As already mentioned my surgical work has been much interrupted. I have had to begin doing extractions several times after intervals of a year or more during which I have not had a knife in my hand. I have therefore had a considerable experience of the difficulties of the operation.

Text books - perhaps because they are written by specialists who have rapidly mastered the smaller difficulties - are wanting in detail, and, as regards these difficulties Herbert remarks, "No detail is too small for recognition that is practical and not too obvious and that helps in any degree towards good results."

Dexterity in operating may be improved by various exercises, and, short of the actual operation, no exercise/

no exercise is so useful as the extracting of the lens from the eye of a freshly killed animal. I have certainly increased the steadiness and muscular control of my left hand by exercising it. Twice I have had to depend mainly on my left hand for several weeks, my right hand being put out of action by injury.

I thus got into the way of shaving, stropping a razor and so on with my left hand and I have kept up the practice; I also found practice on freshly killed goats eyes very useful in training my left hand. But, when it comes to performing extraction upon the left eye I believe in giving the patient the benefit of the better hand and until the surgeon has by experience become very deft with both hands the right hand will be the better.

The average surgeon finds it no easy matter to place the incision exactly as he wishes even with the right hand.

Knapp⁽¹⁾ advises that the left hand should be used at the first opportunity because, if we shirk using it, we will continue to shirk till the left hand is given up for good.

This advice is absolutely unsound I think.
In/

In cataract extraction, more than in any other major operation, a great deal depends on the patient. I test the patient's power of maintaining fixation during the dark room examination, and if it is poor he is schooled by an assistant for some days.

When a patient shows great stupidity or want of control on the table, it is better after a few days attempts to postpone the operation and let further schooling be tried. I have done this on several occasions and on other occasions I have regretted not having done so.

The directions to the patient should be given by only one assistant who can talk his language and this assistant should stand halfway down the table and, raising the patient's hand to the required position, tell him to look at it with both eyes open. This I consider to be of great importance.

A blind person naturally looks towards the person who addresses him and when the instructions are shouted at him by several persons he does not take in what is wanted of him but gets flurried.

The lifting of the patient's hand or the touching of his knee by the assistant who talks to him is a great help especially with a patient who has been/

been blind for allong time. His muscular sense indicates to him the position of his hand or knee.

These minute directions may seem unnecessary to one who does not know the native of India, but from my own experience I know such details to be of practical value.

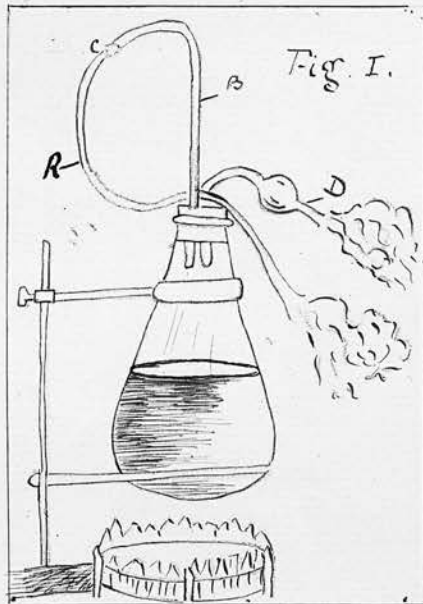
I can well remember some of my early operations when, getting angry with a stupid patient, I would shout to him in language he didn't understand - the native assistant would join in and the patient would either fail to understand or be too frightened and confused to obey.

In Chapter T. I emphasized the importance of the knife being sharp. The "Priestly Smith" machine is useful for testing the sharpness of cutting instruments. One's sense of touch is uncertain and variable.

In addition to the instruments usually mentioned in descriptions of the combined operation two others are required.

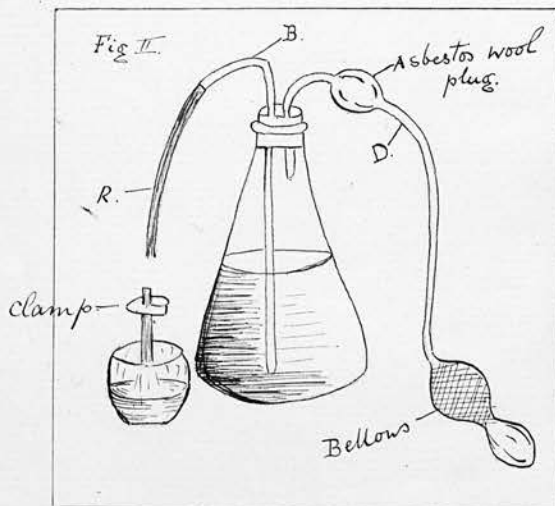
1. A Bowman's stop needle for preliminary laceration of the capsule.
2. An irrigator for irrigation of the anterior chamber/

These 2 figures are taken from Elliott's description of irrigation of the anterior chamber.



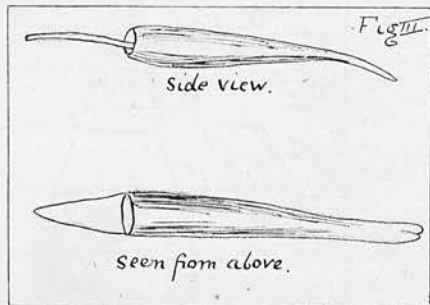
Preparation of Irrigator.

Detach the rubber bellows from the tube D, raise the glass tube B, which dips below the surface of the liquid, as shown in Fig. I, and arrange the rubber tubing R attached to it, so that the end is not in contact with any surface; the bottle should have been filled two-thirds full with normal saline solution, and is now ready for boiling. After free ebullition, and immediately after removal of the flask from the flame, clamp the rubber tube R, and dip its free end under an antiseptic solution, till the apparatus is to be used; lower the tube B to its usual place (vide Fig. II): ~~Cool~~ air enters, but it can only do so through the tube D, the bulb of which M'Keown fills with a filtering plug of cotton-wool.



When one is about to operate, the bellows is attached at D (Fig. II), and a freshly boiled cannula is adapted to the tube R; the clamp is relaxed and the irrigator is ready for work. Unless one is using distilled water, it is absolutely necessary to have the fluid carefully filtered before it is boiled.

To face page 83.



after Elliott.

Illustration of cannula ordinarily
used to irrigate anterior chamber.
The cannula I have used has a shorter
and blunter point than the one
figured here.

I have had no experience of irrigation with McKee's
Scoop irrigating nozzle and irrigating needles.

chamber as practised by M'Keown; for description of which see Fig^s. I. II & III

Preliminaries.

The outer eyelashes of the upper lid are cut short and the face well cleansed before the patient is put on the table.

The patient is now put on the table,; surgeon and chief assistant cleanse their hands as carefully as for an abdominal operation and the conjunctival sac is cleansed by the assistant as follows, sublimate solution 1/3000 being used.

The skin of the lids and face is first washed and then the sublimate lotion is dropped freely into the conjunctival sac from swabs dipped in the lotion, squeezed out usually 12 or 13 times, the eyelids being everted and moved about a little. After 10 minutes occupied by cocaine instillation there is found in fairly normal conjunctivæ an accumulation of mucus which is detached by free movement of the lids on one another and washed away with sterile salt solution, doubtless carrying away micro-organisms with it. In conjunctivæ altered by chronic inflammation this mucus is generally absent or scanty - in them more lotion is dropped. At the close of the operation a curette is passed over the whole of the palpebral conjunctiva to remove any further collection of /

of mucus.

Such is the technique of Herbert which I have adopted.

The instruments except the knife and needle are sterilised by boiling.

When doing more than the extraction on the same morning the points of fixation and iris forceps, hook, curette, vectis and nozzle of irrigator are all sterilised in the flame of a spirit lamp after each operation and this rapid means of sterilising is used when indicated at any time during the operation. A lid elevator should always be ready for use.

While the assistant is cleansing the conjunctiva and instilling cocaine, the surgeon himself completes the sterilising of the cutting instruments. My own practice is to put knife and needle in 1/20 carbolic lotion for from half to one hour and before operation I steep them in absolute alcohol for 5 minutes and then lay them on a dry sterilised frame.

I also see to the preparation of the irrigator unless I have a reliable trained assistant to whom I can entrust his duty.

To show how necessary this supervision is I may say that recently I found a young hospital assistant/

assistant testing the temperature of the sterile saline solution with his fingers.

Sufficient time must be given for the cocaine effect to reach the iris. This is a point of importance too little emphasized, as a rule, in descriptions of the operation.

In my early operations I noticed that the iridectomy was often painful and this was no doubt due to my proceeding too quickly. If the iridectomy causes pain the patient will not unlikely lose self-control expecting to be hurt at each further step of the operation.

From observations I have made in many cases I have come to the conclusion that it takes fully 10 minutes from the first instillation of the cocaine till the iris is affected. I therefore give 4 instillations at 3 minutes intervals and allow 3 minutes after the last instillation. This gives 12 minutes from the first instillation to the last cleansing of the conjunctiva and first step of the operation.

Steps of the Operation.

1. The eye is fixed /

- I. The eye is fixed with toothed forceps or double hook.
- II. A stop speculum having been inserted, the anterior capsule is freely incised with a Bowman's stop needle.
- III. The section is made in the cornea or in the limbus, its size being regulated according to the nature of the cataract to be extracted.
During the section the chief assistant raises speculum off the globe.
- IV. Iridectomy.
- V. Delivery of the cataract is effected by pressure below with a tortoise shell spoon and above, if this necessary, with the curette.
- VI. The speculum is removed, and the anterior chamber is cleared of cortical matter and blood by irrigation.
- VII. The iris is replaced by irrigation - the toilet of the conjunctival sac is performed and the eye is closed.

I shall now discuss the steps of the operation in detail.

- I. I have taken the fixation of the globe as a separate/

separate step in the operation because herein lies a fruitful source of accidents in inexperienced hands. The beginner is very apt to press unconsciously with the fixation forceps while he is concentrating his mind on the making of the incision. I have several times become conscious of this fault and I am sure that this^{is} one reason why, in the hands of the inexperienced, there is often premature escape of aqueous, prolapse of iris, spontaneous delivery of lens often in its capsule and, worst of all, escape of vitreous. That spontaneous delivery of the lens in its capsule does so occur and that pretty often I know from my own experience, from discussion with other surgeons and from a perusal of hospital records; in this connection see cases I., VI.

It is therefore essential that pressure be not made on the globe with the fixation forceps.

II. Preliminary needling of the capsule is done as follows.

The eyeball being fixed in the usual way the needle is entered just external to the corneo-scleral margin i.e. in the sclerotic itself.

It/

It is guided carefully over the iris and the capsule is gently incised in the centre of the pupil; the needle is very gently and slowly withdrawn.

(2)
Drake-Brockman used to make the puncture in the corneo-scleral margin and then enter the knife at the same spot, but the first time I operated thus there was an escape of aqueous so I now make the puncture in the sclerotic.

Pope from a wide experience of the manoeuvre has made the same modification of Drake-Brockman's original method.

I was led to adopt this procedure early in 1904 from a study of the writings of the Madras School. The capsulotomy had always been to me the most difficult step in the operation and in this connection Norris⁽³⁾ thinks that "the cutting of the capsule is probably the most difficult and uncertain part of any cataract operation." This is not true however of primary capsulotomy.

Let me compare Preliminary needling of the capsule with capsulotomy as usually done with the cystotome.

1. The cystotome from its shape is not a good cutting/

cutting instrument. The cutting edge is very small and if this edge is tested on a drum one notices the following defects. If the kid is not tightly stretched it will give before the cystotome and presently the stem of the instrument will impinge on the drum and the point will no longer exert pressure.

Even supposing that the point penetrates the drum, when the cutting action is begun the blade may slip out of the puncture and if, to keep the blade in place we exert more pressure in a direction from base to point of blade and then cut we are trying to cut with the angle formed by blade and shaft; dragging in place of cutting results.

This is my explanation of what undoubtedly occurs in capsulotomy, namely failure to incise the capsule and rupture of the zonule.

Again the blade of the cystotome is much hidden by the shaft when in use.

The above objections do not apply to the instrument used in preliminary needling. The needle is easily sterilised and lasts well without getting blunt.

2. Even in a favourable case with a prominent eye the introduction and withdrawal of the cystotome calls/

calls for considerable manipulative skill to avoid damaging the cornea and iris, and the least movement of the eye exaggerates the difficulty.

In a sunken eye with a collapsed anterior chamber the manoeuvre is one of great difficulty.

One is apt to forget in which direction the blade is pointing and thus the cornea may be damaged on withdrawal.

The pressure of a conjunctival flap adds to the difficulty sometimes by getting in the way and generally by causing bleeding.

Any movement during capsulotomy endangers the zonule and ciliary regions.

Needling is an easy manoeuvre and there is no risk of accident from movement.

3. In capsulotomy the blade of the cystotome is often lost sight of, as soon as we turn the cutting blade downwards to cut the capsule, we no longer see the point of the blade.

If, as often happens, there is no blood in the anterior chamber this difficulty is exaggerated.

In/

In preliminary needling we can see exactly what we are doing, there is no need for haste as the eye is still intact. The position and extent of the opening in the capsule can be varied at will.

4. There is considerable risk of the zonule being ruptured during the cystotomy.

In this connection Herbert⁽⁴⁾ remarks that when there is but little soft cortex, as in hyper-sclerotic lenses and in some over-ripe cataracts, the pressure of the cystotome may tend to dislocate the lens backwards, rupturing the suspensory ligament, or its point may stick in the firm lens substance, and so pull the lens upwards with the movement of the cystotome.

Fuchs⁽⁵⁾ also mentions this risk.

I think this is one factor in causing prolapse of the vitreous.

Herbert⁽⁶⁾ says of vitreous prolapse "more often the accident is due to ill advised pressure with the cystotome or during the delivery of the lens or cortical matter."

In preliminary laceration of the capsule there is distinctly less risk of this accident happening/

happening for the operator can clearly see the point of his instrument and can judge of the amount of force he is using to incise the capsule. If one part of the capsule proves too resistant-~~and~~ in one over-ripe cataracts there is often a central opaque patch-~~he can~~ incise another part and thus lessen the risk of rupturing the zonule.

5. Failure to incise the capsule with the cystotome is not uncommon.

Herbert⁽⁷⁾ writes as follows " If the point of the cystotome be buried in a layer of blood lying in the anterior chamber - as it must often be, when a conjunctival flap is made use of without irrigation of the anterior chamber - the chance of accidents is much increased by the surgeon being unable to see whether the capsule has been perforated or not." and again he says. "The spotted capsule of Morgagnian cataracts can probably always be penetrated by a sharp cystotome but a blunt point may simply catch in it and pull it about. The puncture of all Morgagnian lenses should be made rather sharp otherwise,

- a. the soft bag of fluid is simply indented by the point/

point of the cystotome - not penetrated; or
 b. the sac, on being pricked, so quickly collapses
 that it recedes from the cystotome when only a
 small and insufficient opening has been made."

(8)
 Fuchs also mentions this point but it is, in
 my opinion, not sufficiently emphasized in the
 literature of cataract extraction.

This mistake has occurred in my own experience.
 Sometimes I have been uncertain whether I have incised
 the capsule, sometimes I have been certain that I
 have failed. I have also seen more experienced
 operators than myself suffer from this drawback to
 the use of the cystotome.

Additional Advantage of Preliminary Needling.

Another great advantage of this procedure I
 mentioned in Chapter III under the head of Diagnosis.
 The surgeon uses the needle as a probe and can confirm
 or refute the diagnosis he has already made by
 inspection.

If the cortex is soft and flocculent with small
 nucleus the needle will sink into it easily.

In the Morgagnian cataract the capsule is
 usually/

usually incised easily with the needle and a cloud of turbid fluid escapes. Occasionally the capsule of this variety of cataract is tough. If too tough to be incised we must extract in the capsule.

In the case of hard nuclear cataracts, such as we often find in old people, the needle will pierce the capsule but will go no further and the lens is felt to recede as a whole before the needle. This feeling is peculiar to the hard cataract and we may be sure that it will separate readily from the capsule and be easily delivered, provided our incision is sufficiently large.

In Chapter III. I showed that it is not a sound procedure to vary the size of an incision according to our diagnosis of the consistence of the cataract when the diagnosis is made only from the appearance of the lens; but I am sure that we can, safely modify our incision according to the diagnosis made from the preliminary needling.

For instance, in a Morgagnian cataract with a large escape of turbid fluid we may safely make our incision a small one.

Again in a cataract with a capsule so tough that/

that we cannot incise it we may decide on extraction in the capsule and here, by so deciding before making our incision, we have the advantage of being able to make our incision terminate well forward in the cornea - the incision that does not damage the peripheral part of the cornea which gives support to the hyaloid membrane - the most favourable incision to avoid prolapse of vitreous.

The other extreme, the nuclear cataract can, as I have shown, be accurately diagnosed and the risk of too small an incision is thereby avoided.

In the cases which lie between those extremes we are less certain of the diagnosis and must keep in mind that too small an incision is infinitely worse than too large a one.

The only disadvantages of preliminary needling that have occurred to me are : -

Disadvantages of Preliminary Needling.

1st. the occasional escape of aqueous. This happened in the first case in which I tried the method; the eye remained quiet and extraction was successfully performed 3 days later. See case.

The escape of aqueous may be avoided by entering the/

the needle in the sclerotic and with drawing it carefully and if aqueous does escape, the operation can be postponed without harm.

2nd. The obscuring of the knife blade by escape of turbid cortical matter. As I pointed out in Chapter III. this is more than compensated for by the increase in depth of the anterior chamber and, if the cortex is fluid enough to escape in large quantity, it is clear enough to give a sufficient view of the knife blade.

If the operator considers this objection to be a valid one he can reserve Morgagnian cataracts - which can usually be diagnosed by appearance - for extraction by the usual method.

I have gone into this question of preliminary needling of the capsule at some length as my own experience goes to prove, that, for the average operator, it is a great improvement on the usually practised method of capsulotomy.

The literature on the subject is certainly scanty but the Madras specialists make out a strong case for the procedure and prove that it in no way diminishes good results in the hands of the specialist.

It/

It might still be contra-indicated for the average surgeon if it were difficult of performance or attended with increased risk of accidents but I have shown that the reverse is the case.

III. The Incision.

Many varieties of incision have been described if not actually accomplished in practice.

It is one thing to draw a diagram of a proposed incision but quite another to adhere strictly to it at the operation.

This applies even to the experienced surgeon, the variation being due mostly, to restlessness of the patient, a wrongly placed counter-puncture, hurry in making incision to avoid cutting iris; and sometimes to the knife being blunt and the tissues abnormally tough.

If the operator is aiming at an incision in the limbus - the section most practised - the result of any variation will be, that the incision terminates either too far forward in the clear cornea, or too peripherally in the sclerotic.

Granted that there is this tendency to variation in/

in the case of the most skilful operators it follows that departure from the desired incision is greater in both frequency and extent in extractions done by the inexperienced.

From the standpoint of the average surgeon then which variation gives the best prospect of a good result?

From my own experience and from a consideration of the various accidents that occur I think that too peripheral an incision is distinctly the more dangerous.

The comparative risks may be tabulated as follows-
With too peripheral an incision.

Bleeding during operation ; prolapse of vitreous; prolapse and incarceration of iris with its possible sequelae; infective inflammations and suppuration; plastic inflammation.

With purely corneal incision; sloughing of cornea; delayed union of wound; extreme degree of astigmatism; the inability to make a conjunctival flap.

I shall take up these points seriatim.

- a. Bleeding during operation is a trifling complication/

complication especially if the irrigator be used, but it does to some extent embarrass one.

- b. Prolapse of vitreous is unquestionably the most serious accident that can occur. It is this accident more than any other that becomes less frequent as the surgeon gains in inexperience but it is lamentably common with the beginner.

The peripheral strip of cornea and the adjoining part of the sclerotic keep the ciliary body, the base of the iris and the attachment of the suspensory ligament in place. When this part of the sclerotic is incised there is a tendency for the iris and ciliary body to bulge forward in the direction of least resistance.

Thus both at and after operation with incision in the sclerotic we see at the summit of the incision the attached base of the iris bulging into the wound. Even with a firmly united conjunctival flap I have seen the iris bulging forward on either side of the narrow flap and this was after the combined operation.

- c. Most authors are agreed that a too peripheral incision predisposes to prolapse of iris.

In my own cases I have had only one prolapse and/

and one encleisis of the iris and with a few exceptions I have made my incision in the clear cornea^{or} in the limbus; usually my incision begins in the limbus and comes out in the clear cornea.

In Maynard's series of 1000 extractions⁽⁹⁾ the percentages of iris prolapse were as follows.

Corneal incision	6.2%.
Modified linear	14.3%.
3mm flap.	7.1%.

In 1804 extractions Smith⁽¹⁰⁾ had about 2% prolapse of iris, 692 of these were extractions in the capsule, without iridectomy.

Even allowing for considerable error due to the personal equation this result is good and it is to be noted that Smith brings his incision well forward in the cornea.

With regard to the incision Neve⁽¹¹⁾ says. "There is a zone just within the corneo-sclerotic margin where there is an increased risk of prolapse of the iris. If the incision is still lower down, the lens has to be rotated, thereby slightly increasing the difficulty/

"difficulty of delivery but prolapse of the iris is rare, corneal astigmatism may, however result." It is evidently generally admitted then, that the peripheral incision, more than the corneal incision, predisposes to prolapse of the iris.

Plastic inflammation of the iris. This was long ago recognised as a common complication in V. Graefe's peripheral linear operation.

Critchett⁽¹²⁾ used to recommend, when both eyes were operated on, a peripheral incision in one eye, to obviate sloughing of the cornea, and a corneal incision in the other eye to obviate plastic inflammation - he thus gave the best chance of obtaining good vision in at least one eye. There is not much to be said for this procedure but it expresses shortly the fact that choice of incision is a good deal a matter of compromise.

The disadvantages of a purely corneal incision are:-

- a. danger of sloughing of the corneal flap. This danger is, I think, over-rated. I have never experienced this complication and Smith, with his very large experience of the corneal flap, would certainly have abandoned the method if sloughing were/

were a common occurrence.

As regards suppuration, I am quite prepared to admit that it is more frequent in a purely corneal flap. I think it probably is more common but I think that it is due to the low vitality of the lips of the wound and not to delayed union.

- b. Delayed union does occur and incomplete healing of the wound is fairly common, but suppuration, when it occurs, usually becomes apparent within 24 hours. In fact I have seen it stated that delayed union is per se a protection against suppuration.
- c. Astigmatism is no doubt more likely to be considerable, from the imperfect coaptation of the lips of the corneal incision, but, in the vast majority of native patients who are illiterate this is a negligible result, if the incision is admitted to be good on other grounds.
- d. A conjunctival flap is of recognised value. I have had little experience of this modification myself but recently in Berry's clinique I have been greatly impressed with the early and perfect healing/

healing that occurs when this method is employed.

The reason that I have had so little experience of it is, that I have found it difficult to make the flap without making my incision too peripheral. I do not think that the advantage of a conjunctival flap compensates for the dangers incurred in the making of it by the inexperienced.

The addition of a conjunctival flap makes the operation more difficult and this is what the average surgeon should avoid.

Taking into account the above factors, and ever keeping in mind the danger of vitreous prolapse I would advise that the beginner should make a corneal flap ending well within the cornea, for then a moderate degree of variation from his intended incision will have no serious consequences. As he gains in confidence and dexterity he may make his incision more peripheral and before long attain to the incision which lies in the corneo-scleral junction, except at the summit where it extends slightly into the sclerotic to enable a conjunctival flap to be added.

I shall only refer to three points in the details of/

of making the incision.

1st. The counter-puncture should be accurately placed, entering the posterior surface of the cornea just within its visible margin i.e. we should see the point entering the corneal tissue; this entails that the external limit of the puncture will be just in the scleral tissue.

To insure accuracy the point may be withdrawn several times till the right spot is found. If the counter-puncture is too peripheral bleeding often occurs, the nasal half of the incision is too peripheral and the incision is unevenly made.

2nd. The size of the incision may be suited to the expected size of the nucleus, as I have already indicated, but it must always be remembered that, while too large an incision is an unnecessary mistake, too small an incision may be looked upon as a sin against the patient.

When preliminary needling has shown us that the cataract is an essentially hard one the puncture and counter-puncture should lie in the limbus just above the horizontal meridian of the cornea and the incision should come out in the clear/

clear cornea near its upper margin; nearly half the cornea is included in the flap.

When the cataract is shown to be a Morgagnian one with much fluid cortex, ^{the} incision may be made to include only a third of the corneal circumference.

3rd. Some authors deprecate the cutting of the section by a sawing movement of the knife; why? I cannot understand. If one tries to make the incision by free sweeps of the knife, the knife point probably pricks the nose, and, by trying to bring out the knife without a drawing cut, the tissues are pulled upon and the natural relation of the parts altered.

The Iridectomy. I shall not enter here into a discussion on the relative merits of the combined and simple operations for there are few who will maintain that the combined operation is not the operation for the average surgeon.

As to the performance of the iridectomy I shall only mention one point that has never to my knowledge been referred to in descriptions of the operation.

The manoeuvre is greatly facilitated by the assistant/

assistant making the section of the iris. The operator already has the fixation forceps in his left hand. If he gives the fixation of the globe to the assistant the hold of forceps on conjunctiva is lost or undue pressure is made with the points of the forceps. The letting go and taking a fresh hold of the conjunctiva tends to unnerve the patient and we require absolute steadiness during the iridectomy. It is better therefore for the surgeon to keep hold of the fixation forceps with his left hand draw out the iris with his right and let the assistant make the section. A good assistant is probably more deft with his right hand than the surgeon is with his left.

I have described this manoeuvre supposing the surgeon to be using his right hand for incision, left hand for fixation. If he finds his left hand good enough to make the incision in the left eye he will maintain fixation with his right hand and draw out the iris with his left.

This modification of the technique usually described occurred to me naturally and I have found that it makes the performance of the iridectomy more rapid and easy.

Delivery of the Cataract./

Delivery of the Cataract.

Provided that the section is large enough and that the capsule has been freely incised, the expulsion of the nucleus is an easy matter, but it should always be done gently and slowly so that as much cortical matter as possible may be delivered with the nucleus.

Occasionally delivery is prevented by the upper margin of the lens getting behind the upper lip of the wound. This is more apt to occur with a purely corneal incision. It may be avoided by care in applying pressure with spoon and curette. If pressure is applied above and below simultaneously the pressure of the curette above the upper lip of the wound prevents the lens moving upwards while the pressure below tilts the upper margin of the lens into the wound.

The spot on which pressure should be made with the spoon varies according to the position of the incision. If the incision is peripheral pressure should be made at the lower edge of the cornea for the lens has to turn very little forward to engage in the wound.

On/

On the other hand, if the summit of the incision lies in the clear cornea the edge of the spoon should be applied over the lower third of the cornea and steady pressure made directly backward, for the lower down the incision, the more the lens has to turn on its horizontal axis to engage in the wound.

The spoon should not follow up the lens till the latter is well in the wound - observance of this rule minimises disturbance of cortical matter which is undesirable at this stage.

VI. Removal of the speculum is usually done at this stage but the lid elevator should be substituted for the speculum at any period after the section is made, if the patient is unsteady. With the lid elevator we can almost entirely control the orbicularis muscle, but the assistant who is given charge of the instrument should be careful not to let his attention wander from his duty. If he watches the progress of the operation instead of attending to the control of the upper lid, the elevator is apt to slip from the position it should occupy; embracing the upper margin of the orbit. If the surgeon impresses this on the assistant after putting the elevator/

elevator in position a subordinate can very well perform this duty.

I lay great stress on this substitution of lid elevator for speculum as soon as the patient shows loss of control. It is especially indicated if the assistant is lacking in dexterity for it is not easy to keep the blades of the speculum raised off the eyeball for any length of time.

No doubt spasm of the orbicularis is an uncommon occurrence but, if it does occur when the speculum is not being properly manipulated, prolapse of vitreous generally results; a preventable accident if we use the lid elevator.

Further, I doubt if the power of the speculum, even when well manipulated, is sufficient to resist the contraction of the orbicularis muscle.

I have used the lid elevator pretty often since I watched Smith operating. He removes the speculum on completion of the section as a routine measure.

VII. Removal of cortical matter from the anterior chamber and replacement of the iris.

Irrigation with sterile salt solution is , I consider, the best method of clearing the anterior chamber/

chamber and of replacing the iris.

It is the best method because it is the easiest, the safest and the most thorough.

In India it is particularly desirable that all cortical matter and blood clot should be removed at the time of extraction because after-cataract, due to the proliferation of lens cells, does not appear in many cases till some time after operation, when our patients, having left hospital, are beyond the reach of further treatment.

Retained cortical matter is usually dealt with by the lid manoeuvre or by stroking the cornea from below upwards and it cannot be denied that these methods very often fail and other measures have to be adopted.

This brings me to a comparison of irrigation of the anterior chamber with the use of forceps and curette as regards ease of performance, safety and thoroughness.

1. Ease of performance.

Speaking personally I find the irrigator much easier to manipulate than a pair of iris forceps or the/

the curette in the anterior chamber.

Take, for instance, a piece of cortex lying low down behind the iris. To catch hold of it with the forceps is a very difficult thing to do even for the most expert operator - more often than not a bit of cortex so placed will be left behind.

Even when lying just within the wound a piece of cortex or bloodclot easily eludes the grasp of the forceps.

When dealt with by irrigation no very delicate manipulation is required, the whole chamber being so easily searched by the stream.

I was greatly struck with the ease of manipulation of the irrigator nozzle. The very first time I used it, I entered the anterior chamber with confidence, being able to see clearly the point of the nozzle and the contents of the distended anterior chamber in their relations. I have never felt this confidence when working with forceps or curette in the empty anterior chamber.

These remarks apply with greater force to cases in which the cornea becomes concave after delivery of the lens.

2. Safety.

2. Safety.

The risk of bacterial infection is about the same in both methods. The fluid that flows outward during irrigation will probably remove any doubtful matter that the nozzle may have carried in.

Movement of the eye is fraught with danger to the vitreous when the point of the iris forceps is present in a collapsed anterior chamber - we have a sharp instrument in direct contact with the hyaloid membrane.

This danger is much less during irrigation, for we have the chamber distended with fluid which keeps the hyaloid membrane well away from the point of the irrigator nozzle, and it is seldom necessary to insert the nozzle further than just inside the incision.

I have only employed irrigation in 15 extractions and I have had no bad results attributable to this method.

Elliot¹⁵ has published the following figures - he uses irrigation as a routine measure in every extraction.

500 extractions 10 vitreous prolapses i.e. 2%.

250 extractions 3 vitreous prolapses i.e. 1.2%.

¹³
Neve/

Neve¹³ considers intra-ocular irrigation of value in removing cortex which cannot be easily removed by ordinary methods. By ordinary methods I presume that he means stroking of the cornea.

Herbert¹⁴ after delivery of the nucleus says "Any remaining cortex is usually easily washed out by the surgeon with the irrigator unless it is unripe"; for unripe cortex he depends on rapid dilatation of the pupil leaving the matter to be absorbed. He has never known any accident happen from the introduction of the irrigator nozzle into the anterior chamber. He thinks that prolonged irrigation sometimes has irritated the iris a little but this impression is too feeble to weigh against the very decided advantage of the fluid in getting rid of blood and cortex.

I don't think that any one with a large experience of extraction could say the same for any other method of removal of cortex.

3. Thoroughness of removal.

Elliot¹⁵ writes as follows : "Since I have employed irrigation, I hardly know what it is to leave cortex behind, a very different experience from that/

that of my first 1200 cases operated on without its aid."

There are of course some cases, in which, from absolute want of control on part of the patient, or from escape of vitreous, cortical matter has of necessity to be left behind; but where irrigation fails no other method will succeed.

As regards cases which can be dealt with, though he cannot hope to succeed as thoroughly as Elliot, the average operator will find that he can remove cortex by irrigation which he cannot move by manipulation or the use of forceps and curette.

The probability of after cataract due to cortex being left behind is reduced to a minimum.

When we have to deal with opaque capsule we must either extract in the capsule, remove the capsule with forceps or trust to subsequent removal with forceps or needling.

I have not had sufficient experience of such cases to entitle me to give an opinion as to which method should generally be followed.

I now come to the question of reposition of the iris. It is remarkable with what ease the margins of the coloboma can be replaced by means of irrigation.

In/

In this connection Elliot¹⁶ notes that in his first 1200 cases he often met with difficulty, and even failure, in trying to replace the iris with the spatula or curette and, when visiting the principal eye clinics in Europe, he observed the same difficulties and failures. The opening of the lips of the wound by the irrigator nozzle plus the stream of fluid carries back not only the iris but also tags of capsule which may be lying in the wound.

These tags of capsule are not always visible at the time of operation. In one of my recent cases delayed union was found to be due to a tag of capsule which protruded from the wound.

I am firmly convinced that irrigation is a much better proceeding in every way than the introduction of forceps or curette into the anterior chamber.

I cannot say with equal conviction that irrigation should be practised, as a routine measure, in place of stroking of the cornea, but I am inclined to think that it should be done in every case where inspection of the expelled nucleus and anterior chamber indicates that cortex has been left behind.

Pressure and manipulation is so often useless and occasionally worse than useless. A piece of retained/

retained cortex can sometimes be coaxed almost through the wound but it will come no further.

It is now that the inexperienced operator is tempted to make stronger pressure - he does so, and there is a vitreous prolapse.

Elliot¹⁷ uses irrigation in every case; Herbert¹⁸ does so in every case where there is evidently cortex remaining; Neve¹⁹ in cases of retained cortex when manipulation has failed.

For the average operator I think Herbert's use of irrigation is the soundest i.e. when it is evident that cortex remains use irrigation at once without wasting time by manipulation.

The irrigator, as I have said, is easy to manipulate. The upper lid is raised with the left hand and the patient is told that medicine is going to be put in the eye, generally a comforting remark when the fear of instruments is present.

The fluid should be warm, about 90°F.

The stream should first be played on the cornea and lips of the wound. This cleans the wound externally and accustoms the patient to the stream.

Before introducing the nozzle into the chamber the stream should be directed on the lips of the wound/

wound. Sometimes the lips of the wound separate and cortical matter can be gently washed out by varying the direction of the stream.

If this extra-ocular irrigation is unsuccessful the nozzle should be inserted just within the wound and, according to Elliot, this is sufficient in most cases. By rotating the nozzle the stream can be directed to every part of the chamber.

Finally the iris and tags of capsule should be replaced by a very gentle stream and at the close of the operation we have a full anterior chamber with the flap in its normal position.

Dressing and After Treatment.

I generally dust Iodoform along the edges of the lids and in this connection Maynard²⁰'s figures are interesting.

In his series of 1000 cases, already referred to, Iodoform was used in 217 cases with 5.1% bad results.

The cases in which Iodoform was not used gave 11.3% bad results.

The eye should, I consider, always be examined within 24 hours.

A/

A most excellent bandage, seldom referred to, is the triangular bandage which can be used to close one or both eyes. It cannot come off and it is difficult for the patient to undo it.

I use isinglass plaster to fix the dressing and on top of this a triangular bandage.

In future I shall use shields which are a great improvement on any bandage.

The open method of treatment is absolutely contra-indicated in India on account of the dust in the atmosphere, the habits of our patients and the lack of skilled nursing.

Moreover, experiments are not in favour of the open treatment.

Dalens²¹ found that after 5 to 8 hours bandaging bacteria were decidedly fewer in the conjunctival sac than before disinfection, while after 12 to 14 hours bandaging a variable result was obtained.

Clarke²² showed by experiment that the anterior chamber is most rapidly refilled (5 to 15 minutes) in rabbits, when the animal is kept at rest by an anaesthetic. If the animal is allowed to recover, the movements of the eyeball so interfere with the process that it is not complete for 2 hours.

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Case XIV.

Bikanir 1904.

Rajput female aged 48 admitted 23rd July with double cataract. Some discharge from eyes. Dry films showed staphylococci. Eyes treated daily with Silver Nitrate solution.

L. eye mature. }
R. eye mature. } L.P. good. T. normal.

Double operation on 26th July.

R. eye done first. Preliminary needling of capsule allowing a little soft matter to escape. I should have instilled atropine first for needle pierced the iris. Flap well forward in cornea, iridectomy and then easy delivery of lens. A lot of cortical matter removed by stroking cornea and by irrigation, one piece of capsule distinctly seen remaining.

Except for slight delay in healing of the wound R, eye made a good recovery with good vision.
Discharged 19th Aug.

Case XV.

L. eye of same patient as last.

Operation/

Operation 26th July. Incision well in cornea -
 Iridectomy Cystotomy attempted but from tough capsule
 or blunt cystotome and iris getting in the way I
 failed to open capsule and did not repeat the attempt.
 The lens was delivered in its capsule very slowly.
 No accidents. There was slight iritis appearing on
 the 3rd day but it yielded to atropine and patient
 recovered with good vision. Discharged 19th Aug.

Comment. This case exemplifies the difficulty that
 sometimes occurs in incising the capsule with the
 cystotome. I did not perform preliminary capsulotomy
 as I was at the time comparing the two ways of incising
 the capsule.

Case XVI.

Bikanir 1904.

Binjia Rajput male aged 28.

R. eye recently operated on for hard cataract.

L eye ripe cataract. Examination in dark room showed
 complete opacity of lens with externally a few shining
 sectors. T. normal conjunctiva healthy - P.L. good.
 On 27th July I proceeded to operate with preliminary
 needling of the capsule but so much aqueous escaped
 that I postponed extraction. Atropine instilled.

29th. Pupil dilated - eye quiet. /

29th Pupil dilated - eye quiet.

30th Lens extracted by combined method. The capsule was found to have been freely lacerated by the preliminary needling. Anterior chamber irrigated.

10th Aug. Result good.

Comment. In this case the preliminary needling was done with a corneal puncture.

Case XVII.

Bikanir 1904.

Gorli female Rajput aged 40 double cataract.

Conjunctiva healthy.

R. eye mature.

L. eye nearly mature.

T. normal, both lenses milky.

pupils react well. L.P. good.

R. eye operation 30th July. Preliminary needling allowing much soft matter to escape - small corneal incision made - then the soft cortex escaped and a small bead like body appeared at the incision and then disappeared. It appeared to me to go back. The hospital assistant thought that it came away. It could not be found in the sac.

31st Dressed - a very small nucleus was found lying at/

at the inner canthus.

4th Aug. doing well.

6th Aug. " " left open. Recovered with
good vision.

Comment. In this case preliminary needling revealed a Morgagnian cataract and I was able to make a small incision with confidence. The wound being small and purely corneal I did not do iridectomy.

The small size of the nucleus is noteworthy.
On 10th Aug. the other eye was successfully operated on and a moderate sized nucleus found.

Case XVIII.

Hindu female aged 60 - eyes small and deep set, double cataract of several years duration; pupil reacts well. L. E. fully mature cataract Morgagnian apparently. L.P. good. T. normal.

L. eye operation begun on 19th August, but patient flinched badly on introduction of knife which was not quite sharp, so I withdrew it and left the eye alone for the present. A nervous old patient.

Operation 25th Aug. Patient being so unsteady I made the incision with my right hand - my usual flap.

No/

No iridectomy - capsulotomy attempted. Cystotome not very sharp or capsule tough and lens began to move so I tried to expel in capsule with eye steady but twisted down and out. I got the lens into wound which was scarcely large enough so I made assistant prick capsule with knife - fluid matter gushed out, nucleus came away neatly on point of knife and I then removed capsule with forceps. No accidents.

Patient made good recovery and was discharged on 7th Sept. with good vision.

Comment. In this case I failed to incise capsule and considered it dangerous to make further trial.

I don't recollect why I didn't do a preliminary needling. It would have made the operation much simpler and obviated the dangers of extraction in the capsule in an unsteady patient.

Conclusion.

It might be said that no treatise on cataract extraction is complete unless the vexed question of iridectomy is thoroughly discussed.

I have, however, only discussed the operation from the standpoint of the average surgeon operating on patients who cannot be kept quiet during the after treatment.

Under such conditions the routine performance of iridectomy is unquestionably indicated.

The cases I have quoted are for the most part unsuccessful cases because it from such examples that certain conclusions can be drawn. As I have already remarked we learn more from our failures than from our successes.

The operation, by whatever method, is on the whole highly successful - so that, in judging of the frequency of an accident, such as prolapse, ~~we~~ ^{we} may have several hundred cases free from prolapse and then several cases of prolapse in quick succession. Therefore before drawing conclusions from our successes we must have a very large number of cases to go upon.

The cases I have included have been ^{taken} ~~been~~ ^{verbatim} from/

from notes made by myself at the time of operation. In the different hospitals I have had charge of the eye cases have always been my chief interest and I have never had too much work to allow me to treat and report all my cataract cases personally from first to last.

From this I exclude a few cases operated on at outlying dispensaries.

In this connection I may say something of the remarkable series published by Smith. Vide table 1.

I know Jullundur district very well having visited most of the villages when I was district plague medical officer. I have seen scores of Smith's results and I have often watched him operating.

There is no doubt that he is a highly successful operator but there are the following flaws in his arguments..

- (1). Before his claims regarding extraction in the capsule are proved, he must show that eyes with vitreous loss remain sound - he must disprove the logical inference that detachment of the retina is a frequent result of vitreous loss.
- (2). In his discussion on the figures quoted in Table 1 Smith forestalls criticism thus "I have been/

"been told that it is impossible to do such an amount of work and do it scientifically.....

I see the cases, almost all, when leaving hospital. At both ends of our throng season, I have ample time to examine the cases leaving hospital as regards refraction, but in the "throngest" (sic) times spectacles are fitted by one of the dressers who can do it well."

The admission that, from pressure of work, he has to leave even a small part of the examining and testing of operated cases to native subordinates detracts from the value of the figures; without casting any reflection on the soundness of the practice.

From a large experience of native medical subordinates I can emphatically say, that when the reputation of their official superior is at stake their judgment and reporting of results is apt to be inaccurate.

The scientific mind is rare among them.